CODE-NO: 38144-040-920
FILE NO: P54S+RM101

SERVICE MANUAL

Samsung. 43k.

COLOUR TV RECEIVER
REMOTE CONTROL SYSTEM
CHASSIS NO.: P54S
MODEL: CX512ZSE/SGV

SAFETY CAUTION:
Before serving this chassis it is important that the service technician read and follow the a "Safety Precaution" and "Product Safety Notice" in this Service Manual.

SPECIFICATIONS

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<tr><td>Television System</td><td>PAL/SECAM</td></tr>
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<tr><th>System / I-F</th><th>PAL/SECAM B.G</th></tr>
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<tr><td>Picture Tube</td><td>20", diagonal measured, In-line-gun, Black stripe 90 degrees deflection</td></tr>
<tr><td>Antenna</td><td>VHF/UHF Telescopic dipole antenna
(75 ohm unbalanced type)</td></tr>
<tr><td>Power Requirements</td><td>220V, AC 50Hz</td></tr>
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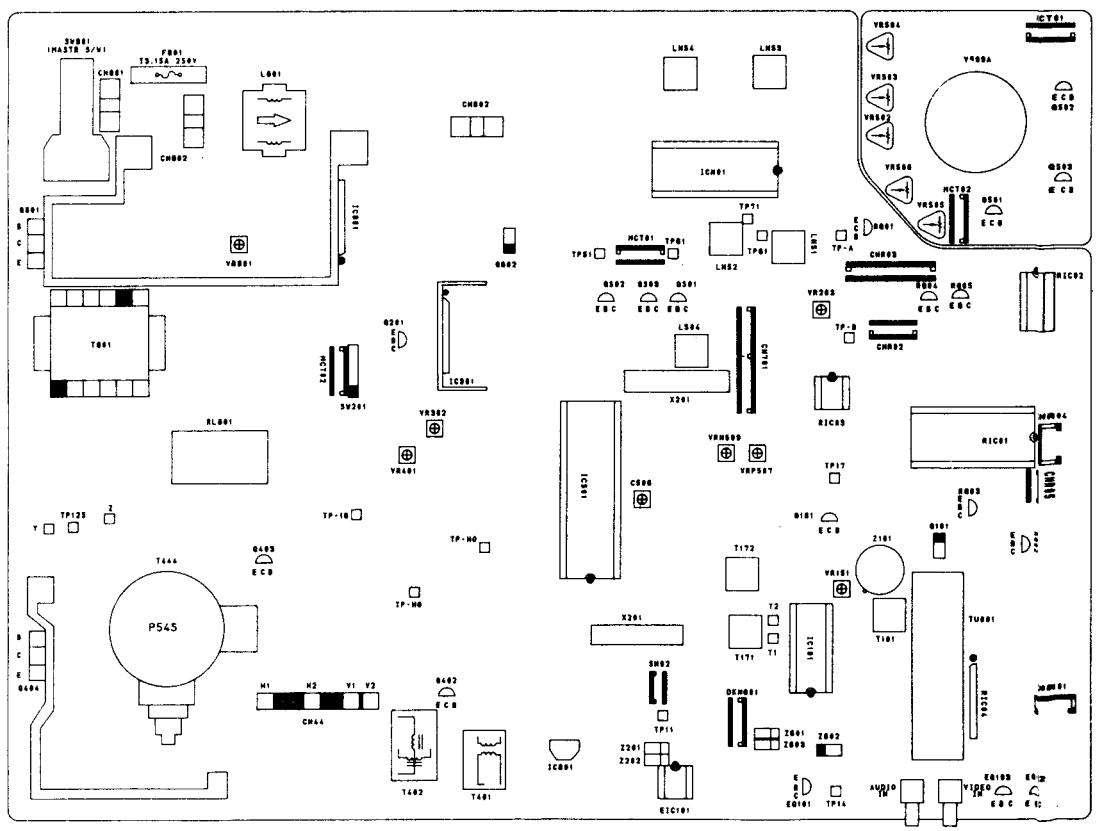
PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These characteristics are often passed unnoticed by a visual inspection and the protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage,wattage,etc. Replacement parts which have these special safety characteristics are identified in this manual and its supplements; electrical components having such features are identified by shading on the schematic diagram and the parts list.
Before replacing any of these components, read the parts list in this manual carefully. The use of substitute replacement parts which do not have the same safety characteristics as specified in the parts list may create shock,fire,X-ray radiation or other hazards.

SERVICE NOTES

1. When replacing parts or circuit boards, clamp the lead wires to terminals before soldering.
2. When replacing a high wattage resistor (oxide metal film resistor) in circuit board, keep the resistor 10mm (1/2 in.) away from circuit board.
3. Keep wires away from high voltage or high temperature components.
4. If any Fuse in this TV receiver is blown, replace it with the FUSE specified in the chassis parts list.



SAFETY INSTRUCTIONS

WARNING : BEFORE SERVICING THIS CHASSIS, READ THE "X-RAY RADIATION PRECAUTION," "SAFETY PRECAUTION", "PRODUCT SAFETY NOTICE" AND "SERVICE NOTICES" DESCRIBED BELOW.

X-RAY RADIATION PRECAUTION

1. Excessive high voltage can produce potentially hazardous X-RAY RADIATION. To avoid such hazards, the high voltage must not be above the specified limit.
   The nominal value of the high voltage of this receiver is 24.5KV at zero beam current (mininum brightness).
   The high voltage must not, under any circumstances, exceed 25.5KV.
   Each time a receiver requires servicing, the high voltage should be checked following the HIGH VOLTAGE CHECK procedure on this manual. It is recommended the reading of the high voltage should be recorded as a part of the service record.
   It is important to use an accurate and reliable high voltage meter.
2. The only source of X-RAY RADIATION in this TV receiver is the picture tube. For continued X-RAY RADIATION protection, the replacement tube must be exactly the same type tube as specified in the parts list.
3. Some parts in this receiver have special safety-related characteristics for X-RAY RADIATION protection.
   For continued safety, parts replacement should be undertaken only after referring to the PRODUCT SAFETY NOTICE.

SAFETY PRECAUTION

1. Potentials as high as 25,000 volts are present when this receiver is operating. Operation of the receiver outside the cabinet or with back board removed involves a shock hazard from the receiver.
   a. Servicing should not be attempted by anyone who is not thoroughly familiar with the precautions necessary when working on high-voltage equipment.
   b. Alway discharge the picture tube anode to the receiver chassis to keep off the shock hazard before removing the anode cap.
   c. Perfectly discharge the high potential of the picture tube before handling the tube. The picture tube is highly evacuated and if broken, glass fragments will be violently expelled.
2. If any Fuse in this TV receiver is blown, replace it with the FUSE specified in the chassis parts list.
3. When replacing parts or circuit boards, wind the lead wires around terminals before soldering.
4. When replacing a high wattage resistor (oxide metal film resistor) in circuit board, keep the resistor 10mm
5. Keep wires away from high voltage or high temperature components.
6. This receiver can be operated under AC 220~240 volts, 50Hz. NEVER connect to DC supply or any other power.

PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These characteristics are often passed unnoticed by a visual inspection and the X-RAY RADIATION protection afforded by then cannot necessarily be obtained by using replacement components rated for higher voltage, wattage, etec. Replacement parts which have these special safety characteristics are identified in this manual and its supplements, electrical components having such features are identified by the international hazard symbols on the schematic diagram and the parts list.
Before replacing any of these components, read the parts list in this manual carefully. The use of substitute replacement parts which do not have the same safety characteristics as specified in the parts list may create X-RAY RADIATION.

ALIGNMENT

1. GENERAL

Read the following carefully before attempting alignment.

1) A warm up period of at least twenty minutes should be allowed for proper stabilization of test equipment and receiver.

2) Alignment requires an exact procedure and sequence of contents.

3) A fine blade non-metallic alignment tool is required for peaking of coils during alignment.

4) Isolation transformer should be used to prevent shock hazards.

5) The test equipment specified or its equivalent is required to perform the alignment properly.
Use of equipment that does not meet these requirement may result in improper alignment.

6) Correct matching of the equipment is essential.
Failure to use the proper matching will result in response which can not represent the true operation of the receiver.

7) Excessive signal and bias voltages from the generator can cause overloading of the receiver circuits and distortion of the response curve.

8) All shields and shield grounding braids must be in place and grounded to chassis before proceeding with alignment.

9) The A.C. power line voltage should be kept within the standard voltage ± 5 volts during alignment.

10) Do not attempt to connect or disconnect any wire while the receiver is in operation.

2. MAGNIFIED RESPONSE ALIGNMENT

2.1 EQUIPMENT

2.1.1. Sweep/Marker generator
2.1.2. Monitor scope (or Oscilloscope)
2.1.3. D.C. Power Supply (+16.5V)
2.1.4. Bias Supply (+4V ~ +4.5V)
2.1.5. Matching Pad (See Figure 3)
2.1.6. Direct probe

2.2 CONNECTIONS

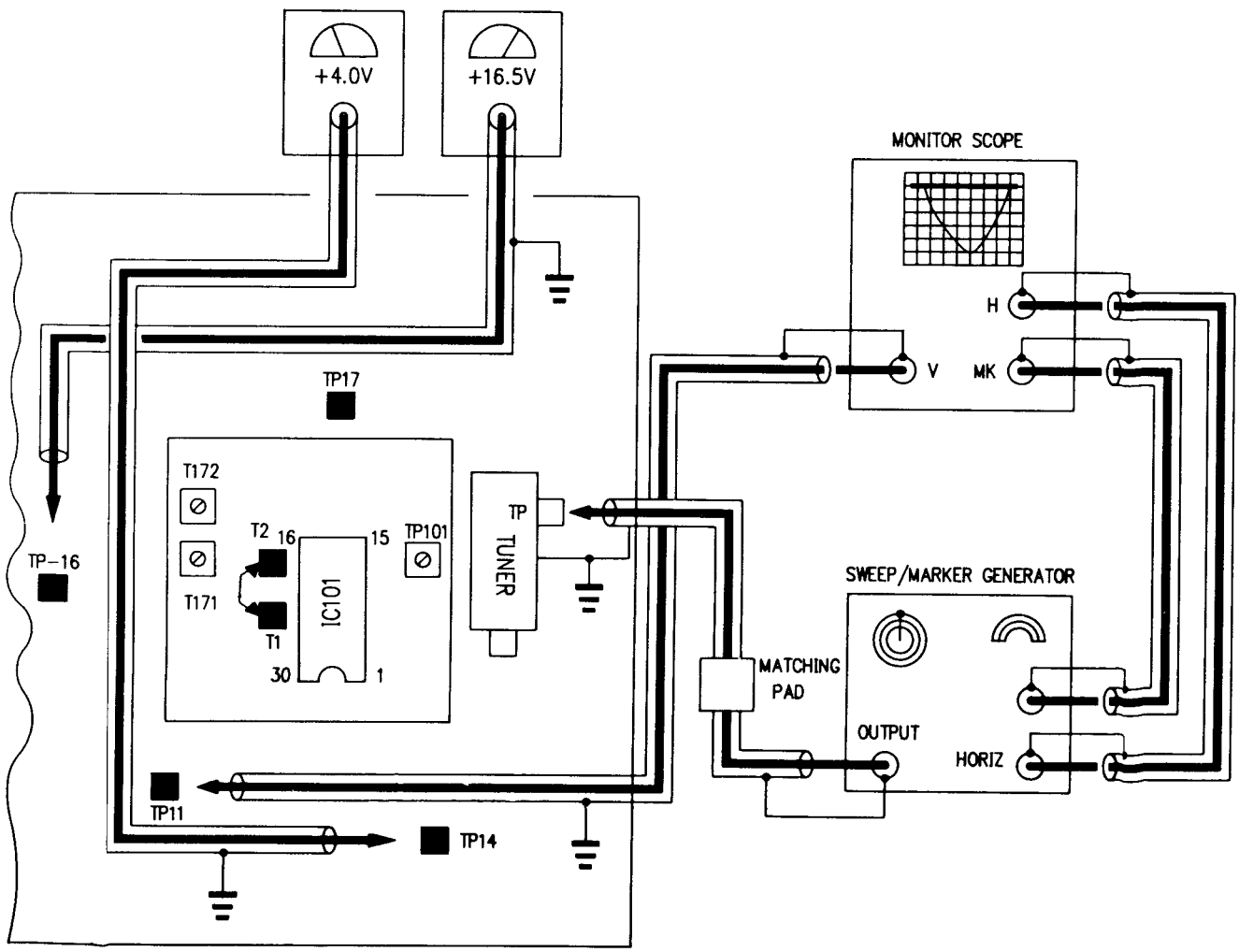


Figure 2

2.3. PREPARATION

2.3.1. Connect the horizontal output of sweep/marker generator to the horizontal input of monitor scope.

2.3.2. Set the monitor scope gain for 0.1V/DIV.

2.3.3. Connect the output of sweep/marker generator in series with matching pad to test point on the tuner through 10K ohm resistor.

2.3.4. Connect the monitor scope with direct probe to terminal TP-11

2.3.5. Apply +16.5V power supply to TP-16 on main board.

2.3.6. Apply +4V～+4.5V bias to terminal TP-14 on main board.

2.3.7. Gradually increase or decrease the output of sweep/marker generator to obtain the 1.0Vp-p response curve on the scope. If necessary, adjust sweep center and sweep width control for the proper location curve.

2.4. STEPS

Adjust the video detector coil (T171) for maximum amplitude at point P. (See Figure 4)

TV SYSTEM TABLE

TV System	C Colour sub-carrier frequency	P Picture Intermediate frequency
PAL B/G,SECAM B/G,	34.47 MHz	38.9 MHz

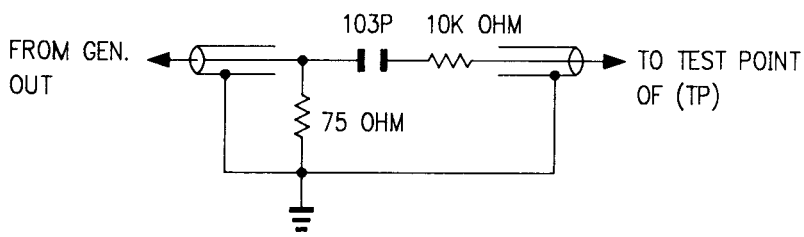


Figure 3

MATCHING PAD

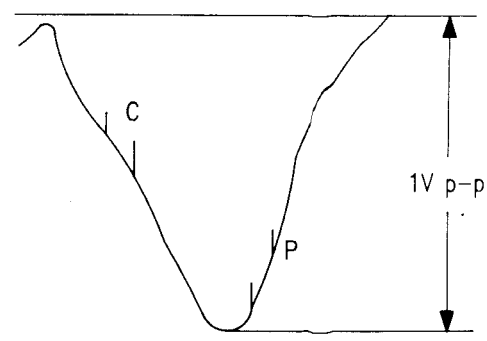


Figure 4

3. OVERALL RESPONSE ALIGNMENT

3.1. EQUIPMENT

3.1.1. Sweep/Marker generator

3.1.2. Monitor scope

3.1.3. D.C. Power supply (+16.5V)

3.1.4. Bias Supply (+4V ~ +4.5V)

3.1.5. Direct probe and Matching pad (Figure 5)

3.1.6. Damping Resistor 100 OHM

3.2. CONNECTIONS

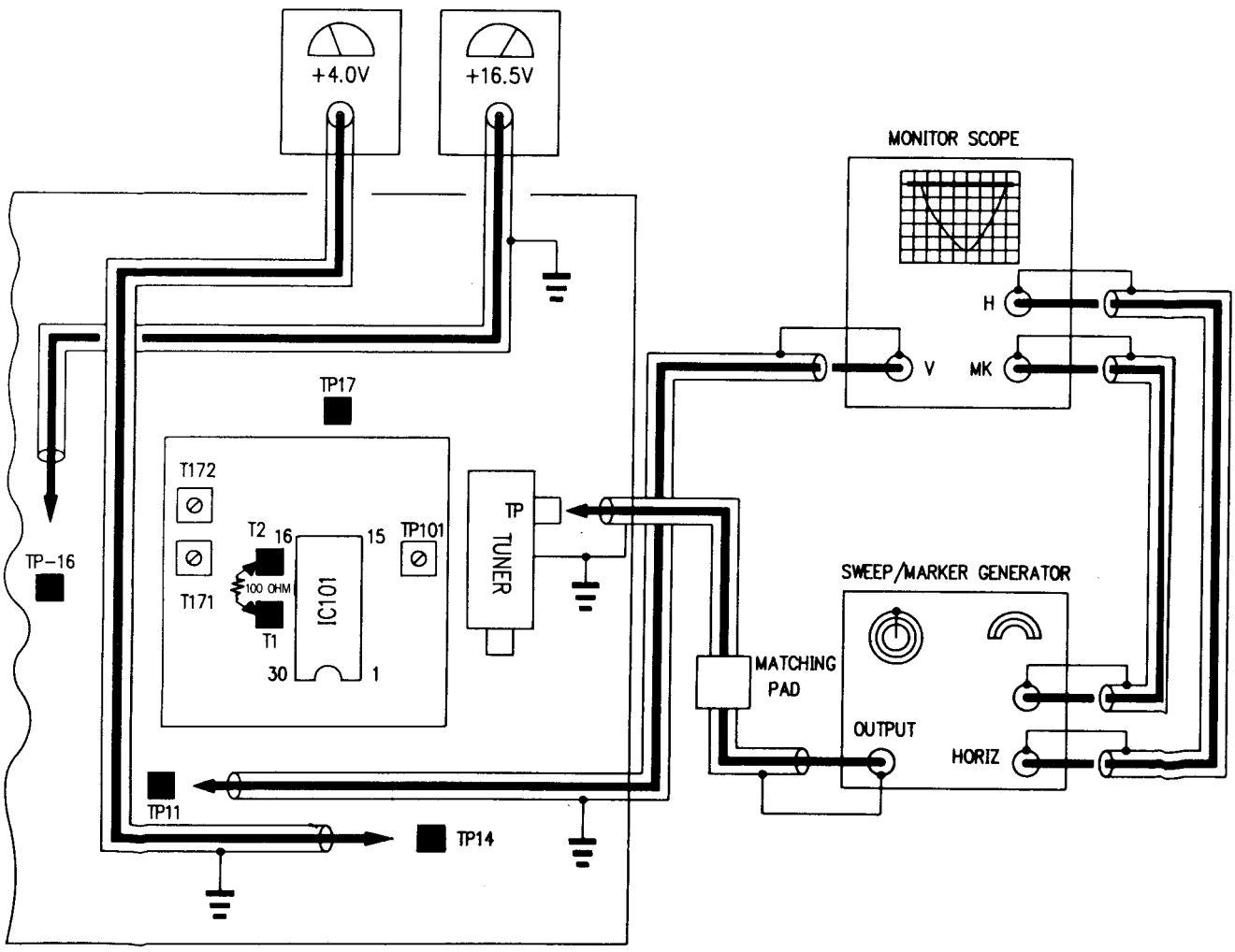


Figure 5 **Overall Response Alignment**

3.3. PREPARATION

3.3.1. Disconnect the CN01 connector.

3.3.2. Connect the horizontal output of sweep/marker generator to the horizontal input of monitor scope.

3.3.3. Set the monitor scope gain for 0.1V/cm.

3.3.4. Connect the output of sweep/marker generator in series with matching pad to test point in the tuner through 10K ohm resistor. (Figure 6)

3.3.5. Connect the monitor scope with direct probe to terminal TP-11 on main board.

3.3.6. Connect the Damping resistor (100 ohm) between T1 and T2 (IC101 #20, #19).

3.3.7. Apply +16.5 volts bias to terminal TP-16 on main board.

3.3.8. Apply +4V～+4.5 volts bias to terminal TP-14 on main board.

3.3.9. Gradually increase (or decrease) the output of sweep/marker generator to obtain the 1.0Vp-p response curve on the scope.

3.4. STEP

3.4.1. Adjust T101 until the amplitude of response curve is maximum, the levels of C&P MARKER are the same level.

3.4.2. If necessary, adjust the core of tuner for the response shown in Figure 7.

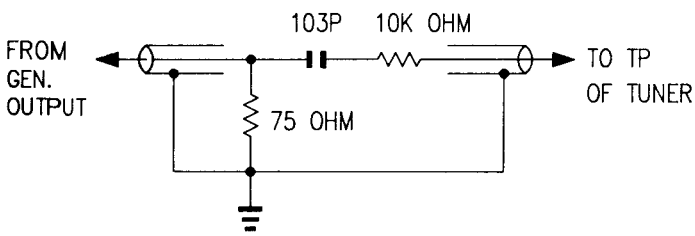


Figure 6.

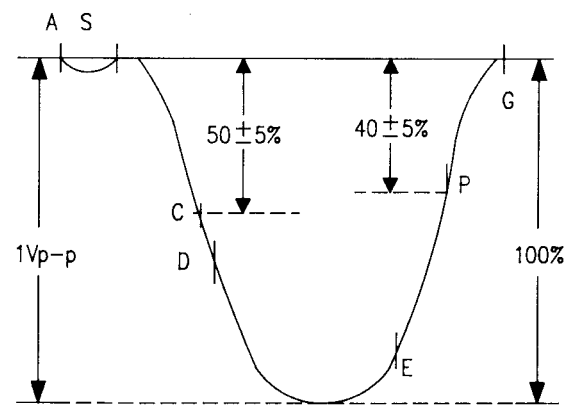


Figure 7

IF Table (Units: MHz)

TV SYSTEM	A	S	C	D	E	P	G
PAL/SECAM,B.G	31.9	33.4	34.47	35.05	38.15	38.9	40.4

4. AFC RESPONSE ALIGNMENT

4.1. EQUIPMENT

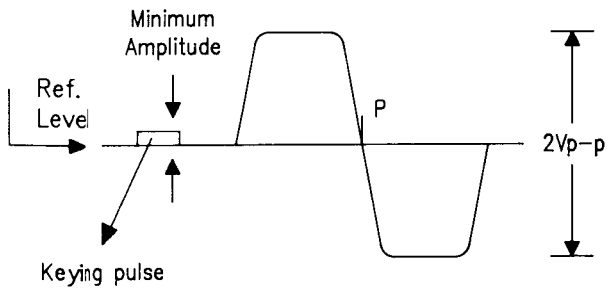
4.1.1. Sweep/marker generator
4.1.2. Monitor scope
4.1.3. DC Power supply (+16.5V)
4.1.4. Bias supply (+4V～+4.5V)
4.1.5. Matching Pad
4.1.6. Direct probe
4.1.7. Digital Voltmeter

4.2. PREPARATION

4.2.1. Apply +16.5 volts to TP-16 on main board.
4.2.2. Apply +4V +4.5 volts to TP14 on main board.
4.2.3. Connect the output of sweep/marker generator through the matching pad to test point of tuner.
4.2.4. Connect the monitor scope with direct probe to terminal TP-17.
4.2.5. Put the AFC switch "OFF". (except remote control model)
4.2.6. Gradually increase or decrease the output of sweep/marker generator to obtain the 2Vp-p response curve.

4.3. STEP

Adjust T172(AFC TANK COIL) the PIF marker position to be kept just the reference level.
After this adjustment, PIF keying pulse on the monitor scope must be in minimum amplitude.
(Refer to Figure 8.)



PIF (P) Point

TV SYSTEM	P
PAL B/G,SECAM B/G,	38.9MHz

Figure 8. AFC Response Alignment

5. HORIZ. OSC. ADJUSTMENT

5.1. PREPARATION

5.1.1. Receive Lion Head Pattern

5.1.2. Short TP-HO and TP-HG with short jumper to ground the sync input for free-running oscillation.

5.2. STEPS

5.2.1. According to above item 5.1.2. horiz and Vert sync will be out of sync.

5.2.2. Maintain vert sync best state with VR302 (Vert. Hold)

5.2.3. Set the Horinontal sync to be with VR401 (Horiz. Hold) to remove the condition.
Adjust the HORIZONTAL HOLD to the center of the pull-in range.

6. FOCUS ADJUSTMENT

6.1. PREPARATION

6.1.1. Check that the power A.C. line is normal.
(A.C. 220 volt, 50Hz)

6.1.2. Connect A.C. line and the receiver power switch sets in "ON" position.

6.1.3. Receive a black and white signal.

6.1.4. Turn the fine tuning control for indication of the clearest picture.

6.2. STEP

Adjust the focus control on FBT(T444) for well defined scanning lines in the center area of the screen.

7. VERTICAL HEIGHT ADJUSTMENT

7.1. PREPARATION

7.1.1. Check that the A.C. power line is normal. (AC 220 volt, 50Hz)

7.1.2. Connect A.C. line and the receiver power switch sets in "ON" position.

7.1.3. Set the channel selector to an active channel. (Lion Head Pattern)

7.2. STEPS

7.2.1. Adjust the VERTICAL HEIGHT CONTROL VR302 so that the linearity may be optimum condition when the inside of the largest circle of test pattern overscan the mask 2 Cm of the top an bottom.

7.2.2. And the center of the circumference circle of test pattern should be visible more than 3 circles.

7.3. NOTE

While this alignment, set the brigtness and contrast control to maximum position.

8. B+ ADJUSTMENT

8.1. Apply voltmeter to TP-125.

8.2. Adjust to 125V with VR801 on main board.

9. COLOUR MATRIX ADJUSTMENT

9.1. EQUIPMENT

9.1.1. Oscilloscope.
9.1.2. Pattern Generator (FG-70)

9.2. PREPARATION

9.2.1. Set the power switch in "ON" position.
9.2.2. Receive the PAL colour signal including U/V signal with colour bar pattern generator.
9.2.3. Set the contrast (VR202), Brightness (VR201) and colour control (VR501 or colour up button) to maximum position.
9.2.4. Connect the Oscilloscope probe to TP-51.

9.3. STEPS

< Method 1 >

9.3.1. Adjust the VR507 (DL phase control) to be proper colour display
9.3.2. Adjust Burst clean trimmer (C506) and DL-Matching coil (L504) to be minimum venetion blind effect.
9.3.3. If Venetian Blind Effect appears after this adjustment, repeat above STEP1 and 2.

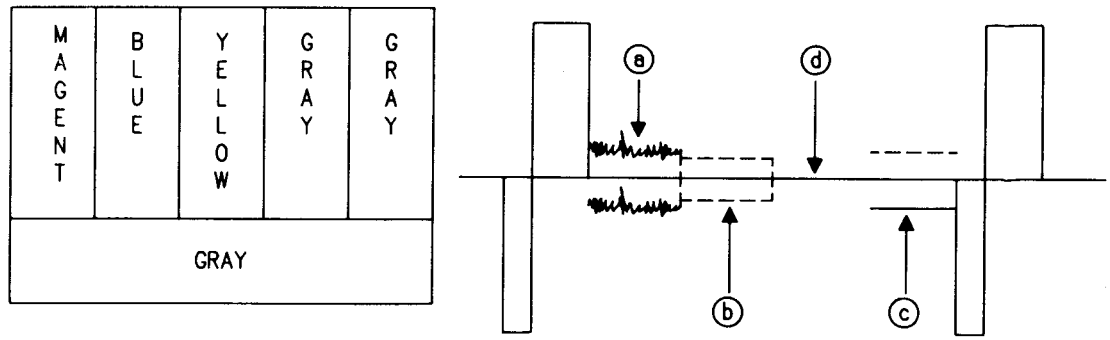
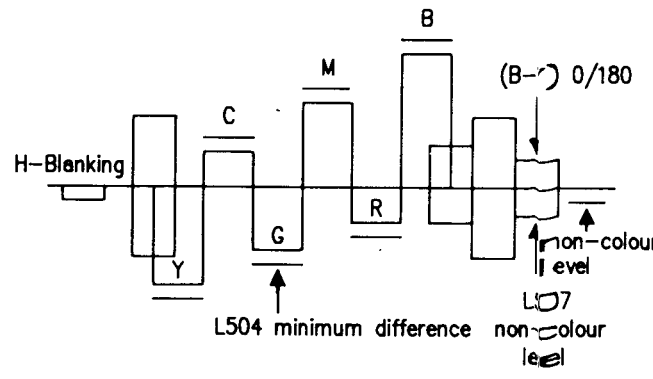


Figure 7

METHOD 2

1. Receive colour bar pattern.
2. Connect the synchroscope to the TP-51 on the main board.
3. Adjust C506 so that the non-colour part and horizontal blanking part are on the same level.
4. Adjust VR507 so that the non-colour part and the (B-Y) 0/180 part are on the same level.
5. Adjust L504 so that each difference on the respective peak become to the minimum.
6. If venetian blind appears after these adjustments repeat above step 3.4 and 5.



10. PURITY ADJUSTMENT

10.1. PREPARATION

10.1.1. Operate the receiver for at least 20 minutes to warm up the C.R.T.

10.1.2. Plug the deflection yoke in the C.R.T. and tighten the deflection yoke clamper screw temporarily.

10.1.3. Plug the convergence yoke in the C.R.T. and set in as shown in Figure 11.

10.1.4. Check that the A.C. power line is normal.
(AC 220 volt 50Hz)

10.1.5. Connect the A.C. line and the receiver power switch sets in "ON" position.

10.1.6. Receive a black and white signal.

10.2. STEPS

10.2.1. Demagnetize the receiver fully by using an external degaussing coil.

10.2.2. Turn the CONTRAST and BRIGHTNESS controls the maximum.

10.2.3. Adjust RED and BLUE CUT OFF controls (VR504 and VR502) to provide only a green raster.

10.2.4. Advance the GREEN CUT OFF control (VR503) if necessary.

10.2.5. Loosen the clamper screw holding the yoke, and slide the yoke backward or forward to provide vertical green belt (zone) in the picture screen. (Figure 12)

10.2.6. Then tighten the convergence yoke clamper.

10.2.7. Slowly move the deflection yoke forward and adjust for best overall green screen.

10.2.8. Roughly tighten the deflection yoke clamper.

10.2.9. Produce the blue and red raster by low light control and observe that good purity is obtained on the respective field.

10.2.10 Tighten the deflection yoke clamper.

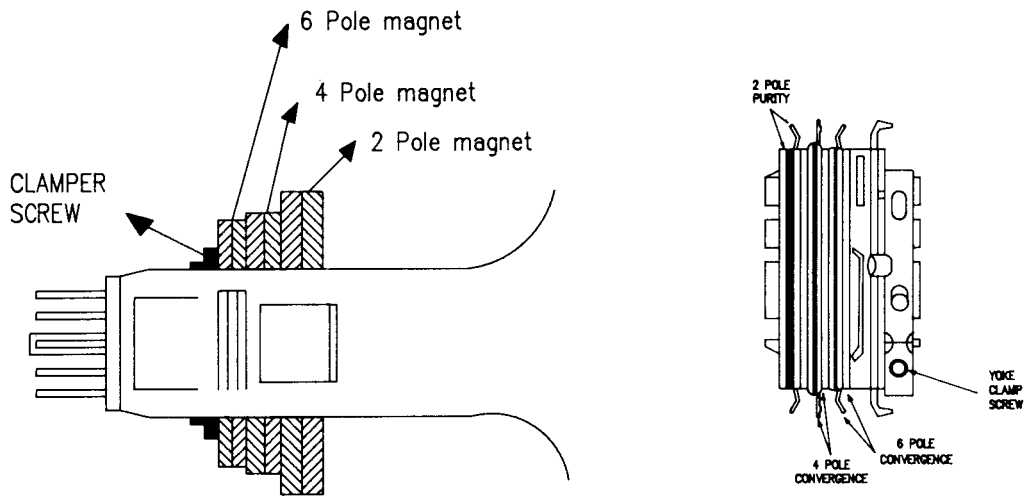


Figure 11. Convergence magnet assembly

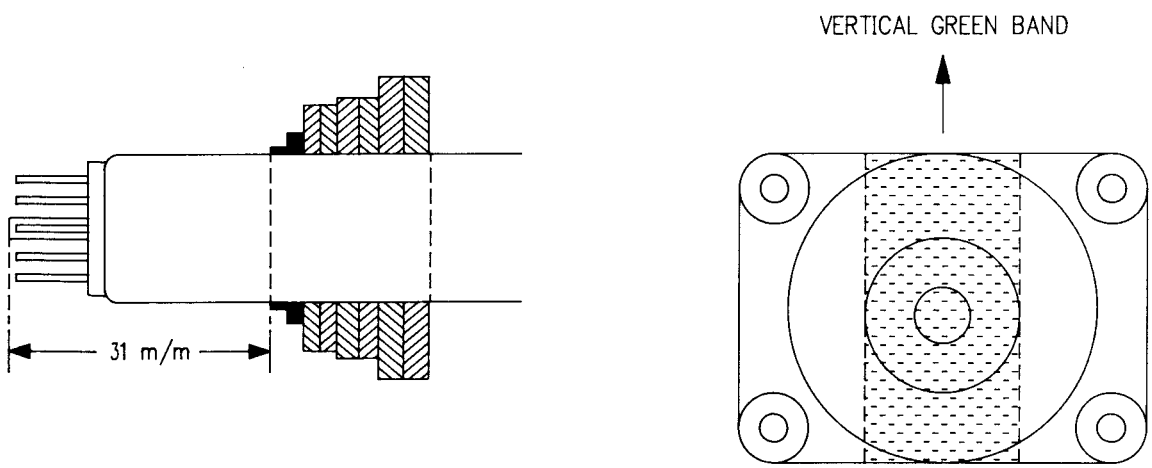


Figure 12

11. CENTER CONVERGENCE ADJUSTMENT

11. 1. PREPARATION

11. 1. 1. Operate the receiver for at least 20 minutes before attempting convergence adjustment.

11. 1. 2. Check that the power A.C. line is normal.
(AC 220 volt, 50Hz)

11. 1. 3. Connect A.C. line and the receiver power switch sets in "ON" position.

11. 1. 4. Receive a crosshatch pattern or dot pattern with a colour bar signal generator.

11. 2. STEPS

11. 2. 1. Adjust the brightness and contrast controls for well defined picture.

11. 2. 2. Adjust the two taps of the 4 pole magnets to change the angle between them and superimpose red and blue vertical lines in the centre area of the screen.

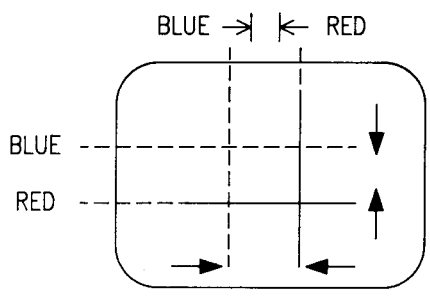
11. 2. 3. Turn the both tabs at the same time keeping the constant angle to superimpose red and blue horizontal lines at the center of the screen.

11. 2. 4. Adjust two taps of 6-pole magnets to superimpose red and blue line with green. Adjusting the angle affects the vertical lines and rotating both magnets affects the horizontal lines.

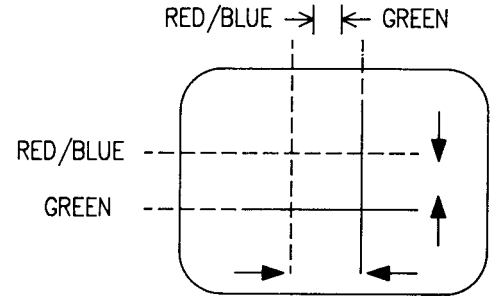
11. 2. 5. Repeat adjustment (2~4) if necessary.

11. 3. NOTE

As 4 pole magnets and 6 pole magnets interact and it makes dots movement complex, practice above steps until understanding red and blue movement. (Figure 13)



4 POLE MAGNET MOVEMENT



6 POLE MAGNET MOVEMENT

CENTER CONVERGENCE BY CONVERGENCE MAGNETS

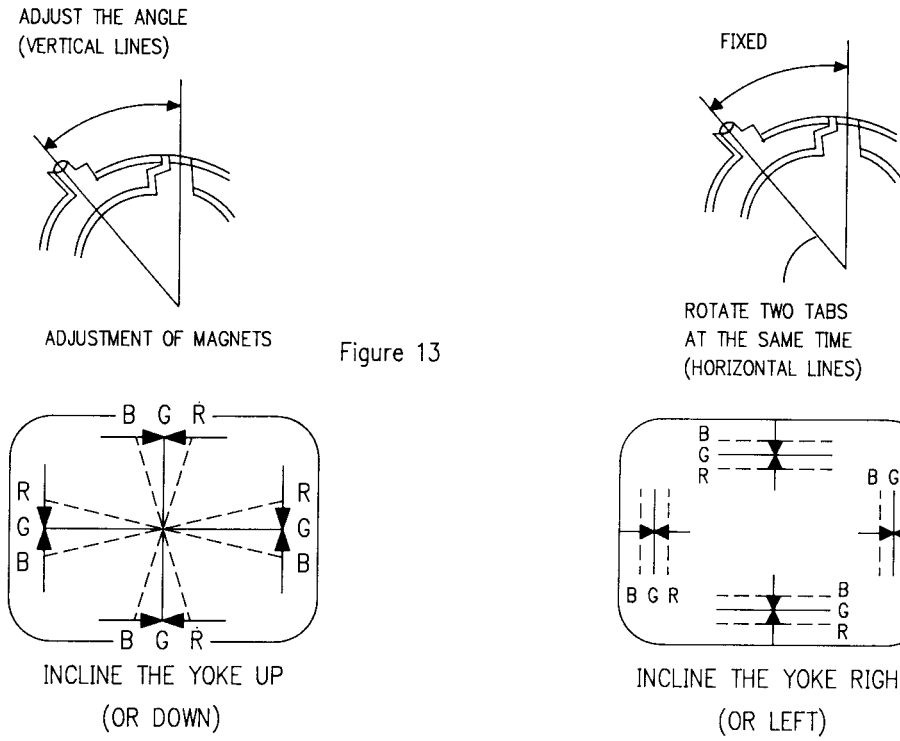


Figure 13

Figure 14. CIRCUMFERENCE CONVERGENCE BY DEF. YOKE

12. WHITE BALANCE ADJUSTMENT

12. 1. PREPARATION

12. 1. 1. Operate the receiver for at least 20 minutes before attempting white balance adjustment.
12. 1. 2. Connect A.C. line and the receiver power switch sets in "ON" position.
12. 1. 3. Receive a black and white signal (Lion haed pattern is better).
12. 1. 4. Set the colour control to center position.
12. 1. 5. Set the brightness and contrast controls to maximum position
12. 1. 6. Set the red, blue and green low light controls to mechanical center position.
12. 1. 7. Set the blue and green drive controls to mechanical center position.
12. 1. 8. Set the screen VR control on FBT to minimum position. (fully counter-clockwise)
12. 1. 9. Temporarily slide the service switch (SW201) on main board to left (Service) position to cut off the vertical oscillation.

12.2. STEPS

12. 2. 1. Rotate the SCREEN control on FBT (T444) gradually clockwise until the first horizontal line appears slightly on the screen.
12. 2. 2. Adjust the two CUT-OFF controls to obtain the slightly lighted horizontal line in the same levels of three colours (red, green, blue)
The line look like white if the CUT-OFF controls are adjusted properly.
12. 2. 3. Reset the SERVICE Switch (SW201) on main board to right position to obtain a raster. ("NORMAL" Position)
12. 2. 4. Adjust the blue and green drive controls to obtain proper white-balanced picture in high light areas.
12. 2. 5. Set the contrast control to minimum position and turn the brightenss control slightly counterclockwise to obtain a dark gray raster.
Then check the white balance in low brightness.
If the white balance is not enough, repeat step (1~4) for correct white balance.

13. CIRCUMFERENCE CONVERGENCE ADJUSTMENT

13. 1. PREPARATION

13. 1. 1. Operate the receiver for at least 20 minutes before attempting circumference convergence adjustment.

13. 1. 2. Check that the power A.C. line is normal.
(AC 220 volt, 50Hz)

13. 1. 3. Connect A.C. line and the receiver power switch sets in "ON" position.

13. 1. 4. Receive a cross hatch pattern with a colour bar signal generator.

13. 2. STEPS

13. 2. 1. Temporarily place a rubber wedge (Spacer D.Y) as shown in Figure 16.

13. 2. 2. Tilt front of the deflection yoke up and down to obtain better convergence in circumference. (Figure 14)
Push the mounted wedge in to the space between picture tube and deflection Yoke to fix the Yoke. temporarily in place.

13. 2. 3. Put other wedge into bottom space and remove the cover paper to stick.

13. 2. 4. Tilt front of the yoke right or left to obtain better convergence in circumference.

13. 2. 5. Keep the yoke position and put another wedge in either upper space.
Remove cover paper and stick the wedge on picutre tube to fix the yoke.

13. 2. 6. Detach the temporarily mounted wedge and put it in another upper space.
Stick it on picture tube to fix the yoke.

13. 2. 7. After fixing three wedges, recheck overall convergence.

13. 2. 8. Tighten the screw firmly to fix the yoke and check the yoke is firm.

13. 2. 9. Stick three adhesive tapes on wedges.

13. 3. PRELIMINARY PREPARATION OF A WEDGE

13. 3. 1. Paint the silicon bond on the edge of the wedge as shown in Figure 15.

13. 3. 2. Remove the cover paper and stick it on picture tube within 10 minutes.

13. 3. 3. Push a wedge into the space between picture tube and deflection yoke as shown in Figure 16.

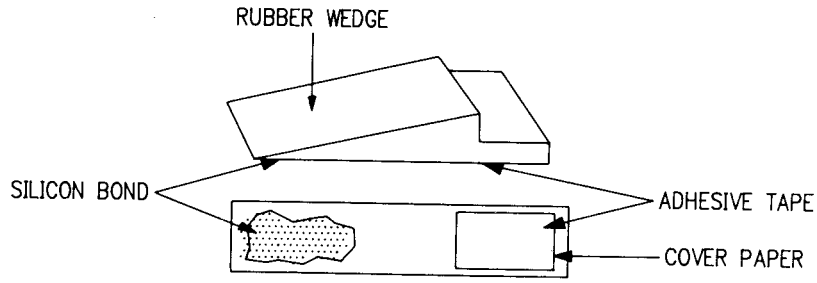
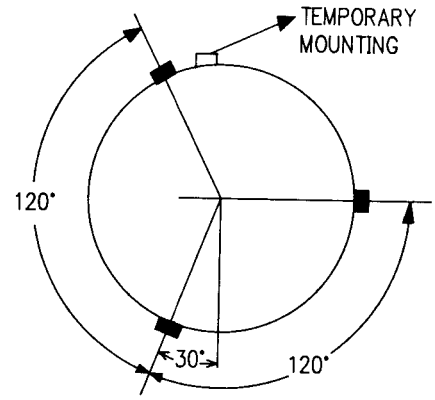


Figure 15. RUBBER WEDGE



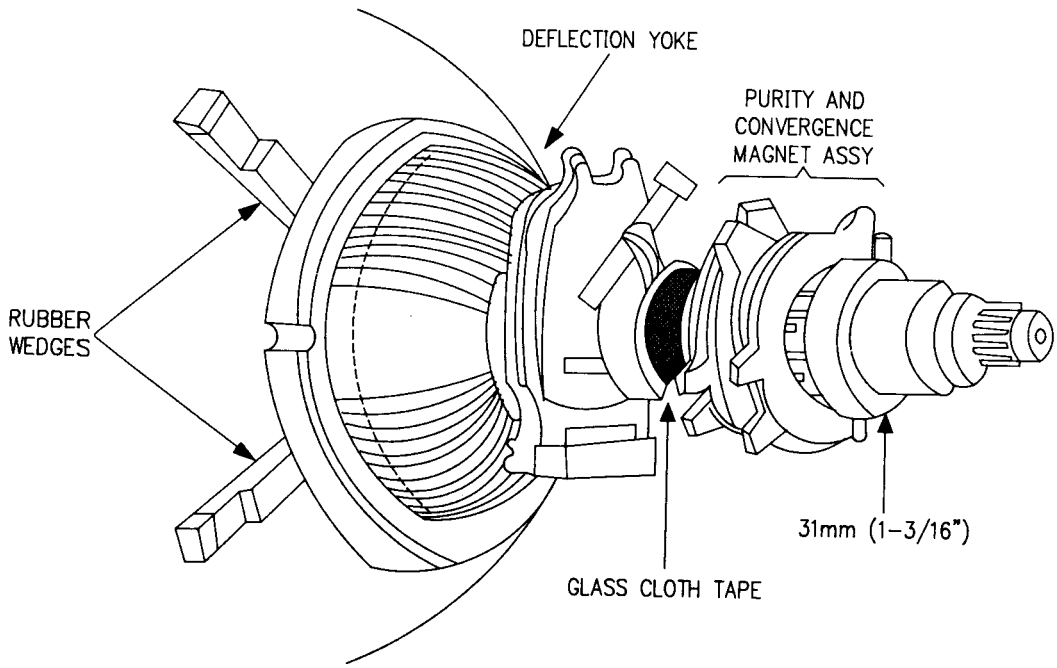


Figure 16. RUBBER WEDGES LOCATION

14. R. F. AGC ADJUSTMENT

14. 1. PREPARATION

14. 1. 1. Connect A.C. line and the receiver power switch in "ON" position.
14. 1. 2. Connect the external antenna to tuner input.
14. 1. 3. Receive Lion Head Pattern.
14. 1. 4. Set the signal strength to be 60 dB.
14. 1. 5. Turn the AGC-Delay control (VR151) on main board to fully counter clockwise position.

14. 2. STEPS

14. 2. 1. Turn the fine tuning control for indication clearest picture.
14. 2. 2. Turn the AGC-Delay control (VR151) on main board to clockwise until snow noise just disappears from the screen.
14. 2. 3. Vary signal strength from weak to strong. (60dB~90dB)
If noise or saturation appears, turn the VR151 slightly to the left or right to obtain for clearest picture.

15. SUB-BRIGHTNESS ADJUSTMENT

15. 1. EQUIPMENT

V.T.V.M. or digital voltmeter.

15. 2. PREPARATION

15. 2. 1. Receive philips colour pattern.
15. 2. 2. Set the contrast and colour controls to minimum postition brightness control to maximum.
15. 2. 3. Set the A.F.C. switch "ON" position. (except remote control model)

STEPS

15. 3. 1. Connect the VTVM or digital voltmeter between terminal "#Z" (+lead) and "#Y" (-lead) on main board respectively.
15. 3. 2. Adjust the SUB-BRIGHTNESS CONTROL (VR203) on main board for 0.25 volts $\pm$0.05 volts on VTVM.
15. 3. 3. Check the proper picture variation by rotating the brightness and contrast control to both extremes. If the picture does not appear dark with the contrast and brightness controls turned to the minimum or not appear bright with the controls turned to the maximum, adjusted the sub-bright control again for the acceptable picture.

NOTE

Operate the receiver for at least 20 minutes before attempting adjustment.

16. SECAM COLOUR ALIGNMENT

PREPARATIONS _____ 1. Setting the trigger mode of the Oscilloscope to EXT. mode, hold the sync. using the induced horizontal voltage.
2. Set the time division of the scope to 20 us/cm.
3. Set the Vert. Gain to 0.1V/cm.
4. Receive SECAM colour pattern.
5. Push the AFC SW ON. (except remote control model)
6. Rotate the colour, Brightness and contrast control to maximum position.(VR501, VR201, VR202)

16.1. Bell Filter Alignment _____

16.1.1. Connect the probe (10:1) of the scope to TP-81.
16.1.2. Adjust LN51 so that each bar of (R-Y) and (B-Y) becomes even respectively. (Figure 1)

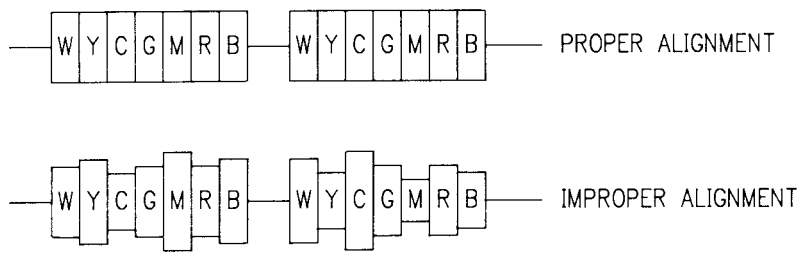


Figure 1

16.2. SECAM Colour Ident Alignment _____

16.2.1. Connect the probe of the scope to TP-71.
16.2.2. Adjust LN52 (Ident. Det. Coil) so that DC voltage is maximum.

16.3. SECAM chroma DET, Coil alignment _____

16.3.1. Connect the probe of the oscilloscope to TP-61.
16.3.2. Adjust LN54 (R-Y Demod, Coil) so that non colour part and horizontal blanking part are on the same level. (Figure 3)
16.3.3. Further, change connection of scope from TP61 to TP51 and adjust LN53 (B-Y Demod, Coil) the same as above. (Figure 4)

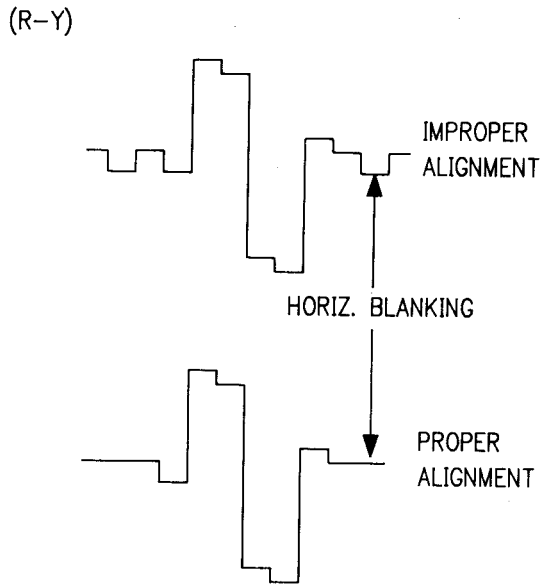


Figure 3

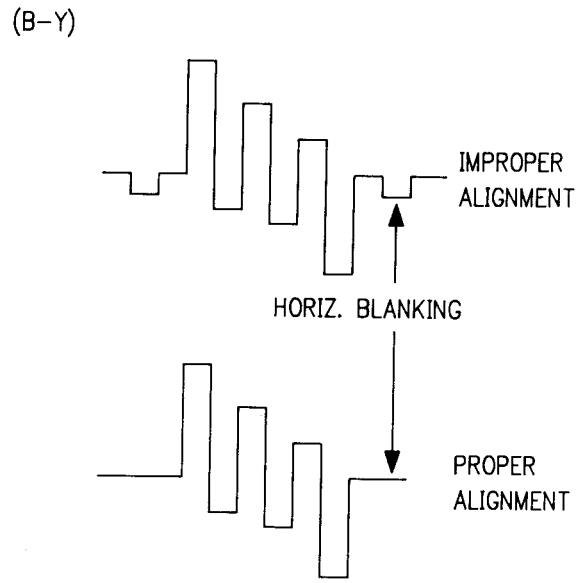


Figure 4

1. INTRODUCTION

The P-54S series chassis assembly is a solid state single board chassis and consists of 5 IC's. It has a chassis design which makes use of the VIF/SIF processing IC(LA7520/KA2919), large-scale integration for the video/chroma/deflection processing circuits (TA7698AP/KA2154), the vertical output IC(AN5512/KA2131), TV/VIDEO switching IC(TEA2014), and PAL /SECAM switching & SECAM chroma IC(M5139AP).
The varactor tuner used with this chassis is mounted on the chassis circuit board. Servicing this chassis is greatly enhanced by the fact that main parts of circuits are integrated. The main circuit board of this P-54S series chassis is devieded into the following functional areas, and the components in each area on it are assigned a particular number series, as indicated bellow :

100 series ---------- Tuner/IF/AFT/AGC processing, 12V regulator.
200 series ---------- Video/Luminance/Sync processing.
300 series ---------- Vertical deflection.
400 series ---------- Horizontal deflection.
500 series ---------- Chroma processing, CRT drive circuits.
600 series ---------- Sound processing.
800 series ---------- AC input, power supply circuits.
XN series ---------- SECAM chroma circuits.('X' means one of R,C,Q,J markings)
XS series ---------- PAL/SECAM switching circuits.

2. IF SECTION

(1) Preamplifier/SAW filter.

The IF input from the tuner is preamplified in a tuned amplifier (Q161) and applied to the SAW (surface Acoustic Wave) filter device (Z101) which establishes the proper IF respanse, with only one adjustment of T101 required for maximum gain.

The input circuit for the SAW filter consists of several functional elements. R100 and L161 are used primarily to match the IF input to a 75 ohm cable (75 ohm input impedance). Q161-preamp transistor is biased as a chass "A" amplifier to provide 20dB. This 20dB gain compensates for the 20dB loss in the SAW filter.

L162 is a SAW input coil. T101 (SAW output coil) is an adjustable coil which resonates with the capacitance of the SAW filter and the IC101 to provide maximum gain at the IF center frequency. At the same time the impedance is adjusted to a level which will give the proper mismatch to provide the desired amount of reduction of TTE (Triple Transit Echo).

A brief description of TTE is as follows : As an acoustic wave travels within the SAW filter, it induces a voltage across the electrodes and the external load. This voltage in turn generates another acoustic wave. This wave travels back to the input where a quarter of its energy is similarly reflected and travels to the output. The echo is 12dB lower than the original wave. Since the echo has made three trips across the substrate, it is referred to as TTE.

A SAW device consists of metal electrodes (or fingers) deposited on a highly polished crystalline piezoelectric substrate. These electrodes-usually composed of a thin aluminum film-form an interleaved pattern on a substrate surface and together make up the device's transducer; the most elementary transducer employs electrode centers spaced 1/2 or 1/4 operating frequency wavelengths apart.

When an RF signal is applied to the input transducer electrode pair, an electric field is generated and the piezo-electric substrate material undergoes mechanical stress, caussing vibrations-an acoustic wave to propagate along the surface. This SAW remains on the surface and only slightly penetrates the crystalline substrate.

Because the SAW transducer is bidirectional, only half its transmitted power radiates toward the output : the other half radiates toward the substrate's edge and is lost or absorbed in a damping material. The waves that propagate to the output transducer produce an electric field between this electrode's fingers which in turn generates a voltage across the output.

The SAW filter, as utilized in the P-54S series chassis, provized all the band shaping for the IF and generates the IF response curve formerly obtained with the LC circuits with adjustable coil (T101).

Not only does the SAW filter generate the proper IF frequencies, it also has the capability to reject unwanted frequencies such as upper adjacent picture (fap) and lower adjacent sound (fas).

R101 is a damping resistor.

The IF signal coming from the SAW filter is coupled throught C100 to pin 10 of IC101. Pin 8 and Pin 11 of IC101 are the terminals of a bias decoupling condensor (C101) for the internal bias circuit.

(2) Functions of the LA7520/KA2919.

The LA7520/KA2919 combines a PIF system and a SIF system in a 30 pins shrink DIP (Dual-in-line plastic package), and performs numerous functions :

1. High gain IF amplification in three gain-controlled amplifier stages.
2. Video demodulation and amplification.
3. High speed AGC voltage generation for IF amps and tuner RF amp.
4. AFT detection and generation for correction voltage.
5. SIF limiting amplification.
6. FM quadrature detection for providing wide frequency band detecting characteristics.
7. DC volume control circuitry.
8. Mute function of both the video and audio.

The Fig. 6 illustrates the internal block diagram of LA7520/KA2919.

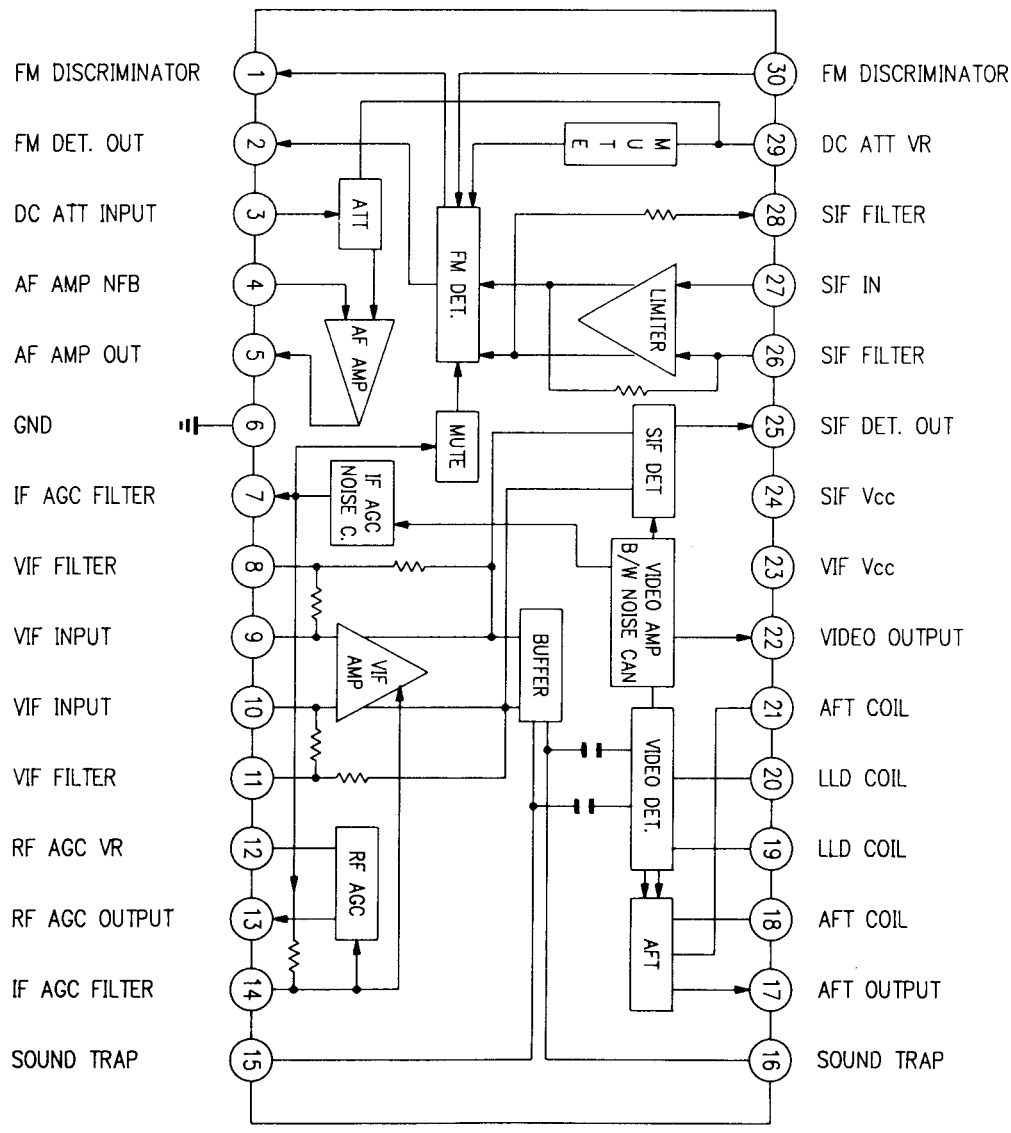


Fig 6. Internal block diagram of LA7520/KA2919

(3) Operations of the PIF section.

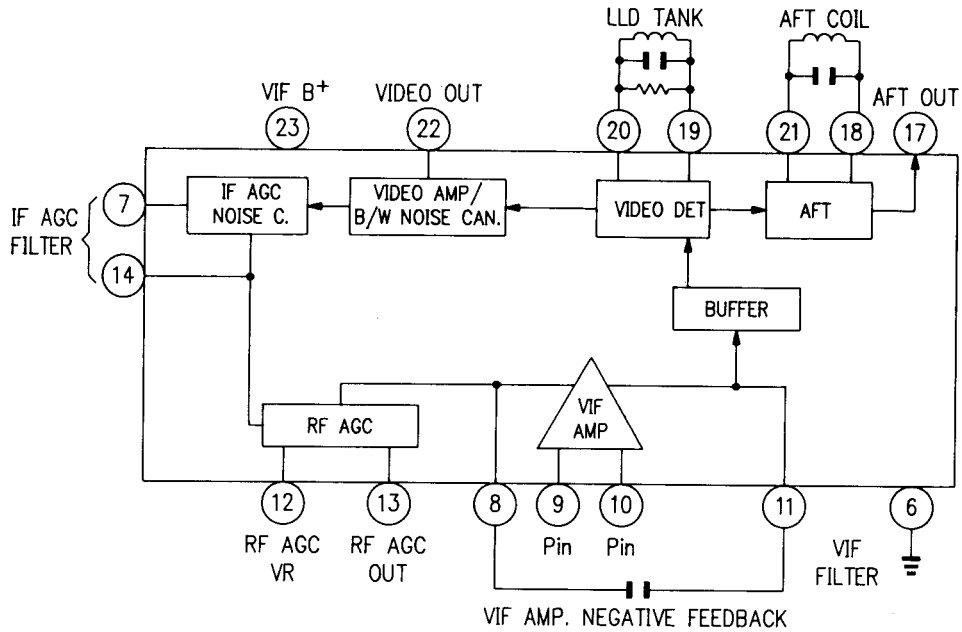


Fig 7. PIF block diagram of LA7520/KA2919

A. PIF amplifier :

Incoming IF signal is amplified by three IF amplifiers within IC101, all three of these amplifiers have their gain controlled by the AGC circuit within. IC101. The input sensitivity of IC101 is 36dB typical. The output IF signal from the last IF amplifier is connected to the video low level detector (LLD) stage internally.

B. Video detector :

The picture carrier component is derived from the PIF signal, limited and phase shifted by a LC tank circuit (T171, R104) connected to pin 19 and pin 20 of IC101 to produce a switching carrier for the low level detector. This reference signal is 38.9MHz in case of B, G system and T171 is turned to this signal. The SIF signal is detected at the same time (intercarrier detection). Detected composite video signal is applied to video output stage, AGC circuit and the noise inverter circuit within IC101 through a part of the video amplifier.

C. Video amplifier :

The video amplifier consists of a buffer amplifier and an emitter follower output amplifier. Pin 22 of IC101 is the output terminal for the composite video signal (=video signal+blanking signal+sync signal). The composite output signal from Pin 22 has 2Vp.p amplitude and sync-negative. R201 is a bias resistor. This output is applied to the video inverter amplifier (Pin 39) of IC501 through L201 and Z201 (sound trap), and the DC component of this output signal can be a bias source of the sequential amplifier. The peaking level can be defined by the resistance of R202.

D. Noise inverter :

The composite video signal is also applied to the AGC circuit and the black and white noise inverter circuit internally.

If the composite video signal includes black pulse noises which exceeds 2.5V to the minus side, they may cause mis-operation of the AGC, unstability of the synchronization or degradation of the S/N ratio.

Also white pulse noises cause degradation of the S/N ratio.

The LA7520 provides noise inverter circuits for both noises to keep a stable operation. A noise whicl exceeds the threshold level is inverted to a gray level (clamp level).

This inverter circuit performs excellent capability of noises without any external components or control signals.

E. AGC circuit :

The output of the IC's video amplifier is also fed to an AGC circuit which generates correction voltages for the chip's three IF amplifiers and for the tuner RF amplifier. The AGC circuit consists of the internal IF AGC circuit and the RF AGC circuit with the delay point adjustment circuit (VR151). At the point of the AGC circuit, the LPF which is made up of C104 (IF AGC filter) is equipped to prevent abnormal AGC operation such as AGC latch up caused by excessive SIF signal component or high frequency noise components. The internal IF AGC controls the 3-stage PIF amplifier gain.

The total gain control range (or the gain reduction range) is 70dB typ. The AGC response speed is determined by an external CR value (C151 and R108) connected to Pin 14 of IC101. If this time constant is too small, it will cause the "zag" during vertical sync period. And if too big, the system will not be able to track rapid input signal level changes such as flattering caused by an airplane and so on.

Pin 13 of IC101 is an emitter follower RF AGC output terminal. The starting point (delay point) of the RF AGC is determined by adjusting the volume (VR151). The maximum voltage of the RF AGC from Pin 13 is 9V and the minimum is 0V. R102 and R103 comprise a voltage divider. Both of IF AGC and RF AGC are the reverse AGC type, so that the output voltage decreases when the input level increases. In case the Audio/Video input jack are equipped in TV set, Pin 7 is fell down to ground in the A/V mode so that TV signal from the tuner is muted.

F. AFT circuit :

A quadrature detector is used to the AFT detector of LA7520/KA2919.

Refer to the Fig 8.

The reference signal is the input PIF signal (limited picture carrier) and the input signal of the AFT detector is derived from the PIF tank (T171) and phase shifted by an AFT tank (T172) which is connected between Pin 18 and Pin 21. The AFT set-up is adjusted by T172.

The AFT detector output is at Pin 17 and is applied to the AFT terminal of the tuner. The maximum voltage at Pin 17 is 11.5V typ. and the minimum is 0.4V typ.

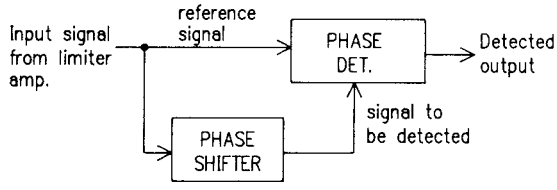


Fig 8. AFT phase detection

The load resistors of R105 and R107 divide the output voltage so that the slope of AFT can be determinded accordingly.

A VVC diode for the AFT action in the tuner controls the oscillation frequency in accordance with the voltage supplied from Pin 17 of IC101.

When higher voltage is supplied, the capacitance of a VVC diode reduces and the oscillation frequency increases. On the contrary, when lower voltage is supplied, the capacitance increases and the oscillation frequency decreases.

(4) Operations of the SIF section.

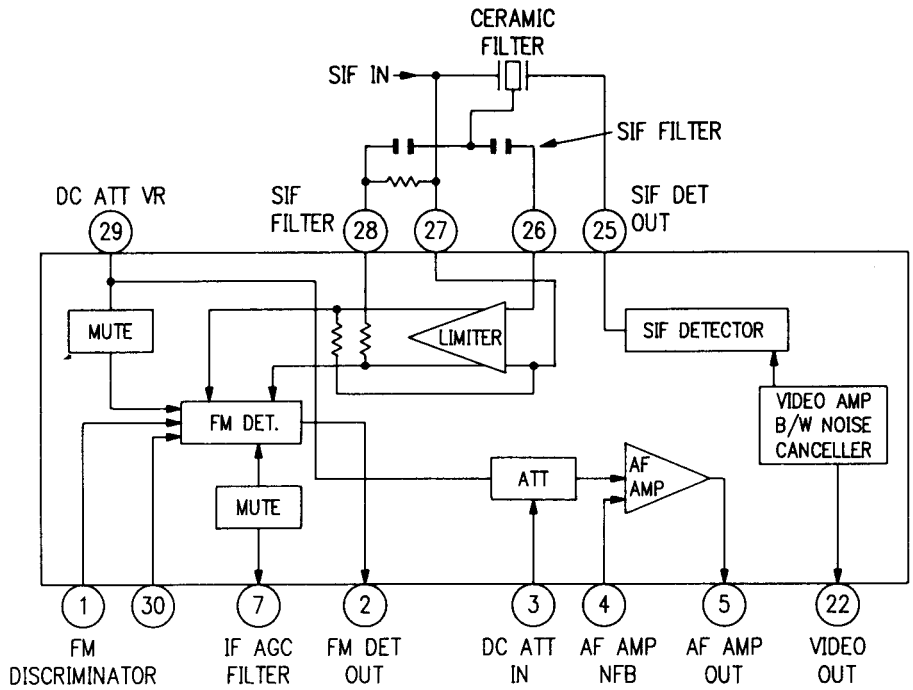


Fig 9. SIF block diagram of LA7520/KA2919.

The SIF section provides all functions for the SIF sub-system, which consist of 3-stage limiter amplifier, FM quadrature detector, DC volume control and audio pre-amplifier with NFB terminal.

A. SIF limiter :

Z601 is 6.5MHz ceramic filter that passes the 2nd SIF signal only eliminates the video signal and other signals.

This inputted signal is amplified to a level of several volts for the FM detector and limited (clipped) to eliminate AM interferences, limiting the amplitude variations does not distort the frequency variations of the signal. A limiter is the SIF amplifier tuned to center frequency, but with the DC operating voltages reduced so that the limiter operates as a saturated amplifier.

B. FM detector :

The output of the limiter amplifier is applied to the FM detector internally, and is tuned to 6.5MHz.

The FM detector is a quadrature detection type using the limiter output and 90° phase shifted signal by an SIF detection circuit (R607, Z602, R606, C604) connected between Pin 1 and Pin 30. Refer to Fig. 10.

The characteristics of distortion and bandwidth of the FM detector are determined by R606 and R607 C604 controls the DC level of AC output from Pin 2. Detected AF signal from Pin 2 is connected to the DC volume control circuit (Pin 3) through a de-emphasis circuit of R608 and C605

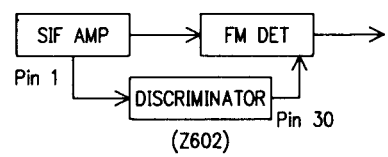


Fig 10. FM detection

De-emphasis circuit attenuates the higher frequencies to compensate for the boost of high frequencies to by the broadcast transmitter.

Boosting of the high frequencies is referred to as pre-emphasis. The purpose is to improve the signal-to-noise ratio for FM reception.

C. DC volume control circuitry :

This circuitry consists of double-balance differential amplifier with the output controlled by the volume control (VR601) coming off of Pin 29. So the output level is determined by the applied voltage of Pin 29. The effective control range is 2.5V to 8V, and the maximum volume control range is 80dB typ.

D. AF pre-amplifier :

The output of the volume control is applied to the internal AF pre-amplifier and Pin 4 is provided for NFB from the sound output amplifier. The amplified AF signal from Pin 5 is coupled through C655 to the output transistors (Q601, Q602), which compose a SRPP (shunt regulated push-pull) amplifier. The maximum output voltage of AF pre-amplifier is 4V rms typical.

5. Functions of TA7698AP (KA2154)

(1) Power section and start-up circuit.

The TA7698AP (KA2154) combines a PAL/NTSC Video-chroma sub system and a defection combination on a single chip to provide a PAL or a PAL/NTSC color television. This device includes a video amplifier, PAL/NTSC color demodulators designed to provide color differential outputs, an improved sync-seperator, a horizontal oscillator with sawtooth type AFC, a horizontal pre-driver, a vertical oscillator and a vertical pre-driver in a 42 pins DIP.

So the Vcc line and the ground line are divided into two systems indivisually in order to prevent the interferences between each section. Refer to the Fig. 11.

Firstly, the Vcc lines are divided into two sources.

One of them is the 12V line of Pin 2 for the video-chroma subsystem, the sync sperator and the vertical deflection system.

The other is the 8V line of Pin 33 providing an internal zener regulator for the AFC and the horizontal section. This 8V line is driven by the 12V of the shart-up circuit.

When power is first applied to the set by the power switch ON, the starting voltage of approximately 12V is input to Pin 33 through R407 and horizontal drive stage. At this moment, FBT is not producing 16.5 Volts. But once the horizontal oscillator and FBT has been operated, D401 is revers-biased and cut off because the cathode voltage of D401 is higher than the anode voltage by the 16.5V back-up.

Thereafter the power source of horizontal deflection section is supplied totally from the 16.5V line, so the unnecessaried power loss is eliminated by this start-up circuit.

Secondly, the TA7698AP(KA2154) equipts seperated ground lines. To prevent inter-section interferences each section has it's own ground line. The lines are tied together at the IC ground pad to reduce common impedances. Pin 11 is a GND line for the video section and chroma demodulator, and Pin 31 is another GND line for the sync seperator and the deflection system. These GND lines are pulled out to each side of the IC package to be minimize the common impedance.

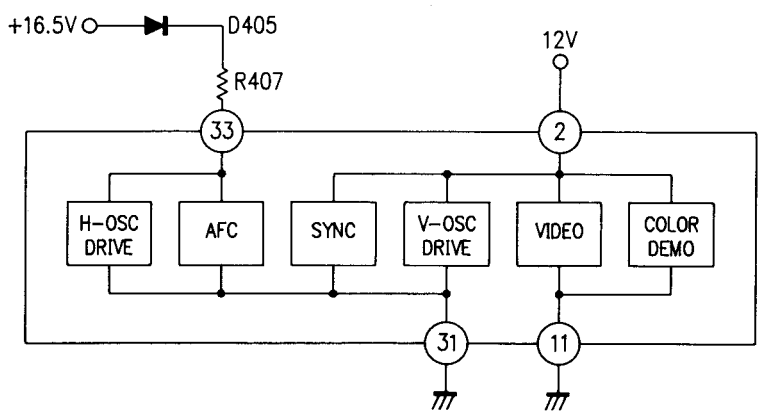


Fig 11. TA7698AP (KA2154) Vcc, GND Seperation

(2) Internal block diagram.

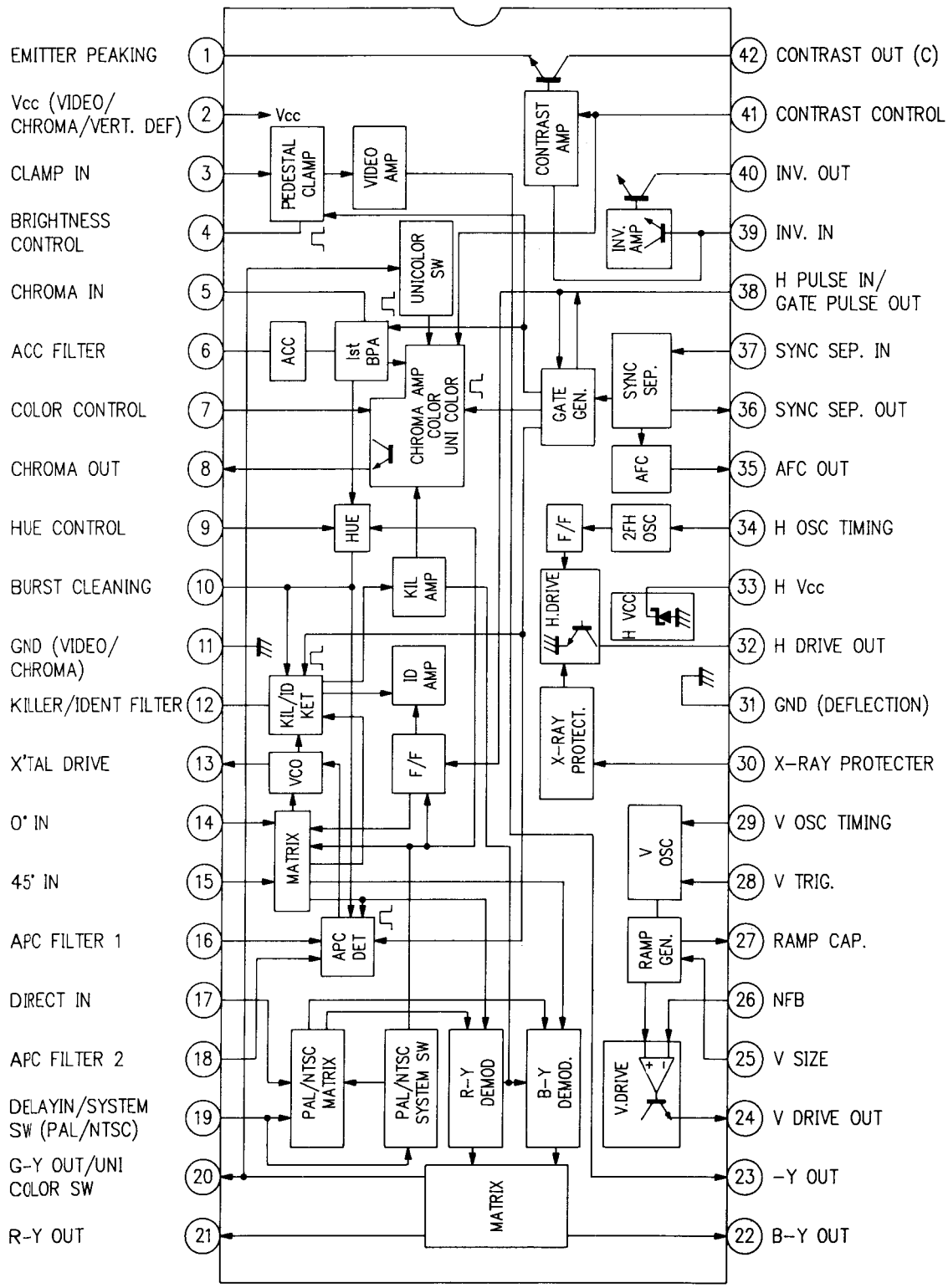


Fig. 12. BLOCK DIAGRAM

(3) Electrical characteristics.

(Video-Chroma Section)

. Simple PAL/NTSC System switch (Demodulator, Flip-flop, Tint control for NTSC)

. Suitable to a Multi-CTV System :

. Minimum Numbers of External Parts Required.

. Stabilized with Respect to Variation of Temperature and Supply voltage

. A Few Initial Adjustment Required.

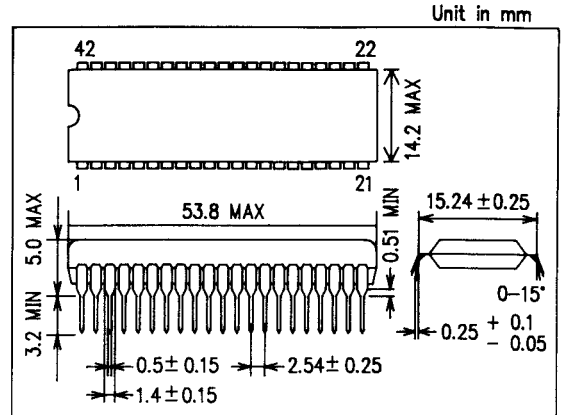
(Deflection Section)

. Excellent Temperature Stability of Horizontal Oscillator.

. Exact 50% Duty Cycle Output Due to the 2-fH Oscillator and Flip-Flop Circuit.

. Excellent Inter-race.

Unit in mm



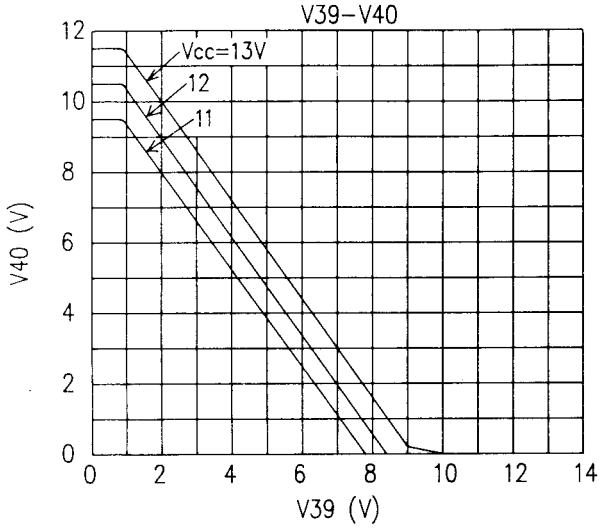
Lead pitch is 254 and tolerance is ±0.25 against theoretical center of each lead that is obtained on the basis of No. 1 and No. 42 leads.

(MAXIMUM RATINGS (Ta=25℃))

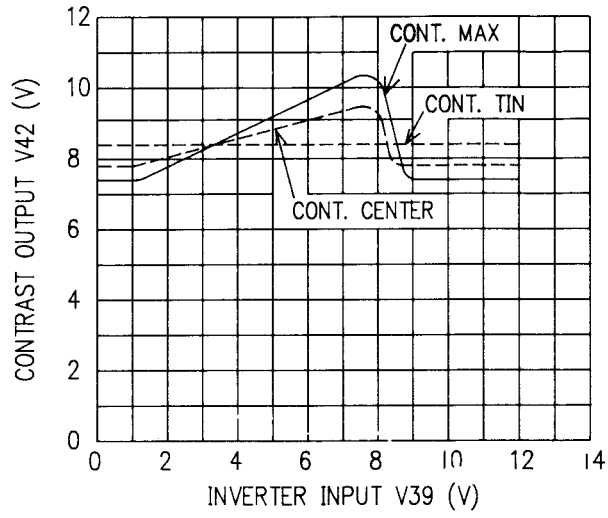
CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	Vcc MAX	15	V
Horiz. Supply Current	Icc MAX	40	mA
Max. Input Signal Level	Ein 3,5,14,15,17,19,28, 37,39	5	Vp-p
Max. Control Terminal Voltage	V4MAX, V5MAX, V7MAX, V9MAX	Vcc	V
Term. 1 Max. Output Current	I1 MAX	4	mA
Term. 8 Max. Output Current	I8 MAX	10	mA
Term. 10 Max. Output Current	I 10 MAX	4	mA
Term. 13 Max. Output Current	I 13 MAX	4	mA
Min. Load Resistance	R LD	1.8	KΩ
Term. 23 Max. Output Current	I 23 MAX	4	mA
Vertical Stage Output Current	I 24 MAX	20	mA
Term. 25 Max. Output Current	I 25 MAX	4	mA
Term. 26 Max. Input Voltage	V 26 MAX	VCC	V
Term. 27 Max. Output current	I 27 MAX	20	mA
Term. 30 MAX. Input Current	-I 30 MAX	1	mA
Horiz. Max. Sink Current	-I 24 MAX	30	mA
Horiz. Ave. Sink Current	-I 24	15	mA
Term. 35 Max. Input Voltage	V 35 MAX	VCC	V
Term. 36 Max. Voltage	V 36 MAX	VCC	V
Term. 38 Max. Input Voltage	V 38 MAX	5	V
Term. 40 Max. Output Current	I 40 MAX	5	mA
Term. 42 Max. Sink Current	-I 42 MAX	4	mA
Max. Power Dissipation	PD MAX	2.2	W
Operating Temperature	Topr	-20~65	℃
Storage Temperature	Tstg	-55~150	℃

Note : Derated above Ta=25℃ in the proportion of 17.6mW/℃.

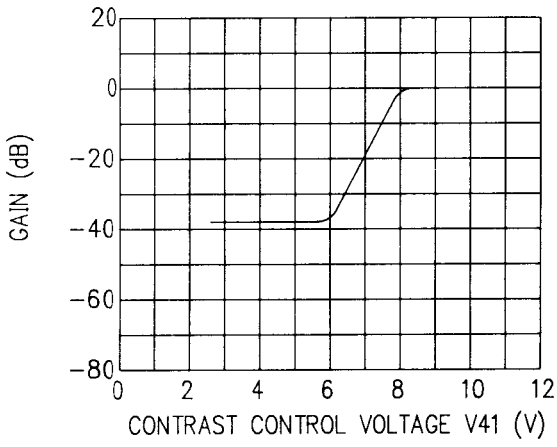
INVERTER DC CHARACTERISTICS



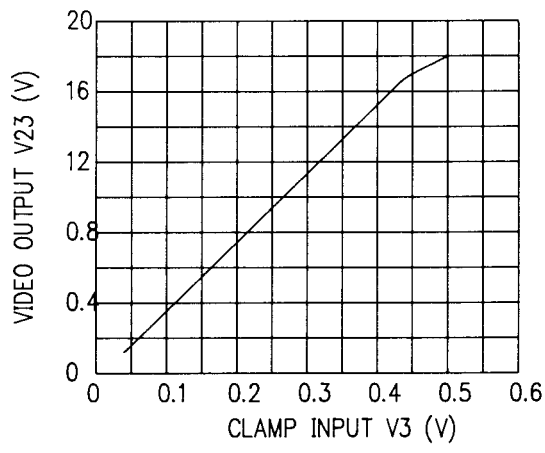
CONTRAST AMP DC CHARACTERISTICS



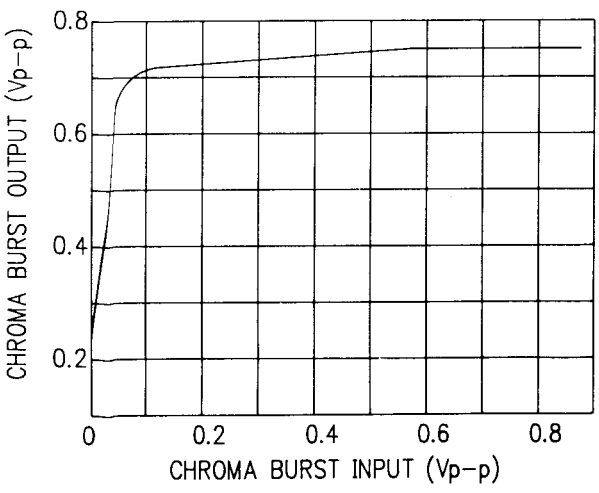
CONTRAST CONTOL CHARACTERISTICS



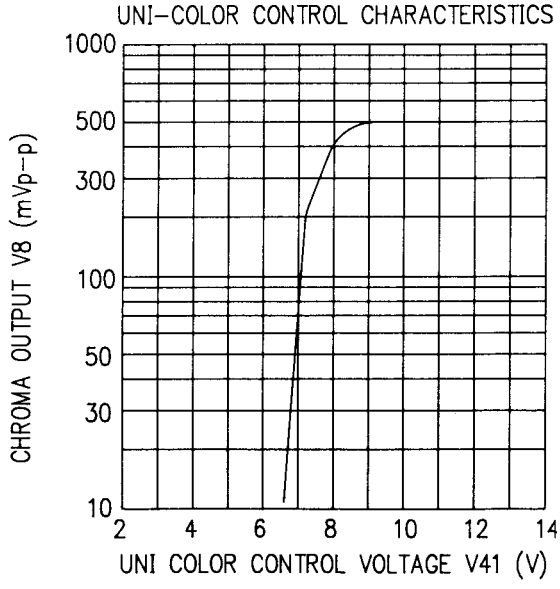
PEDESTAL AMP CHARACTERISTICS



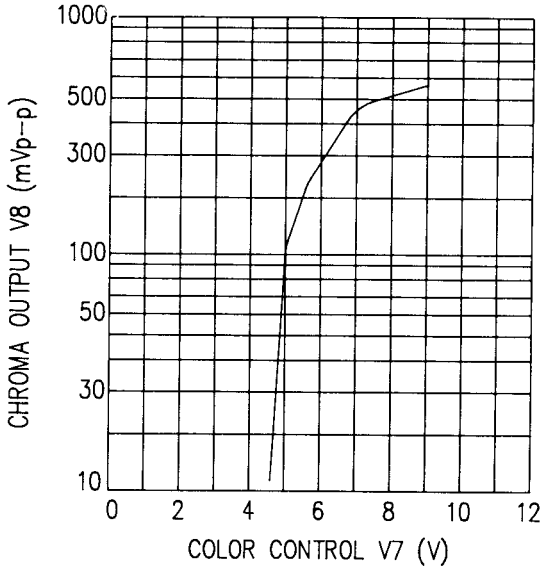
ACC CHARACTERISTICS



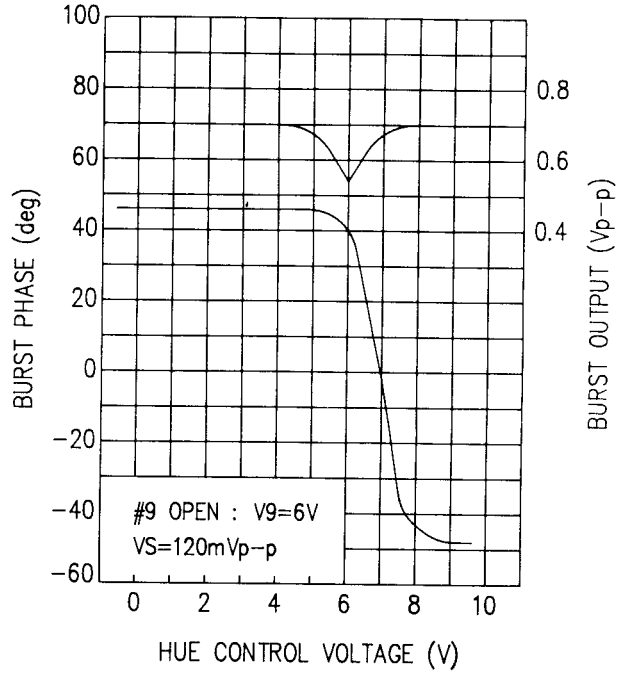
UNI-COLOR CONTROL CHARACTERISTICS



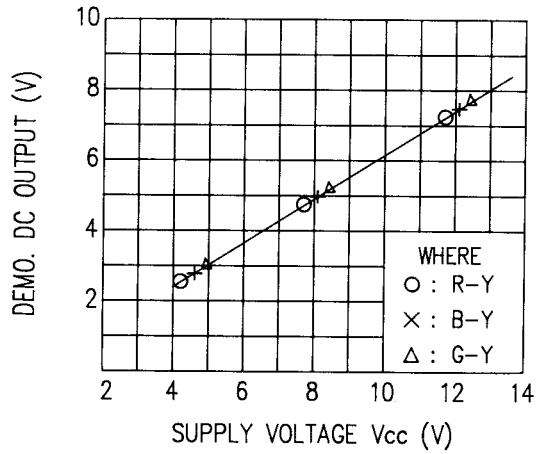
COLOR CONTROL CHARACTERISTICS



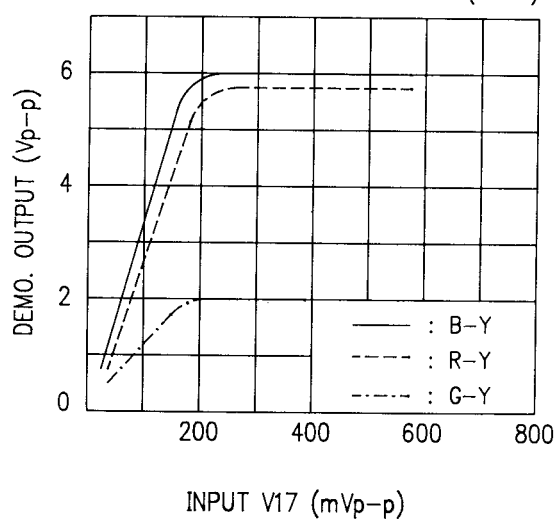
HUE CONTROL CHARACTERISTICS



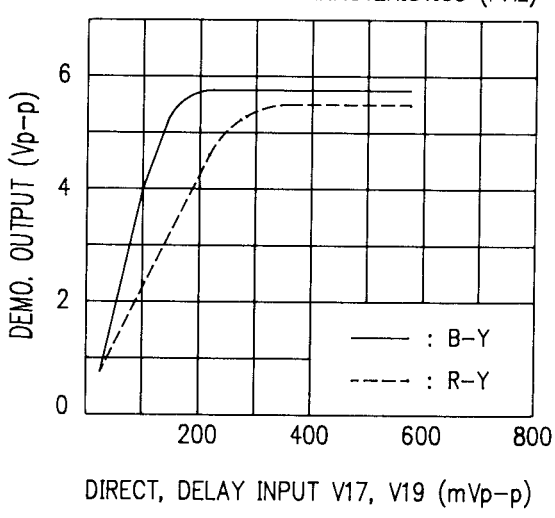
DC CHARACTERISTICS



DEMO. OUTPUT CHARACTERISTICS (NTSC)



DEMO. OUTPUT CHARACTERISTICS (PAL)



6. Video section.

The internal block diagram only for the video processing is shown in Fig. 13.

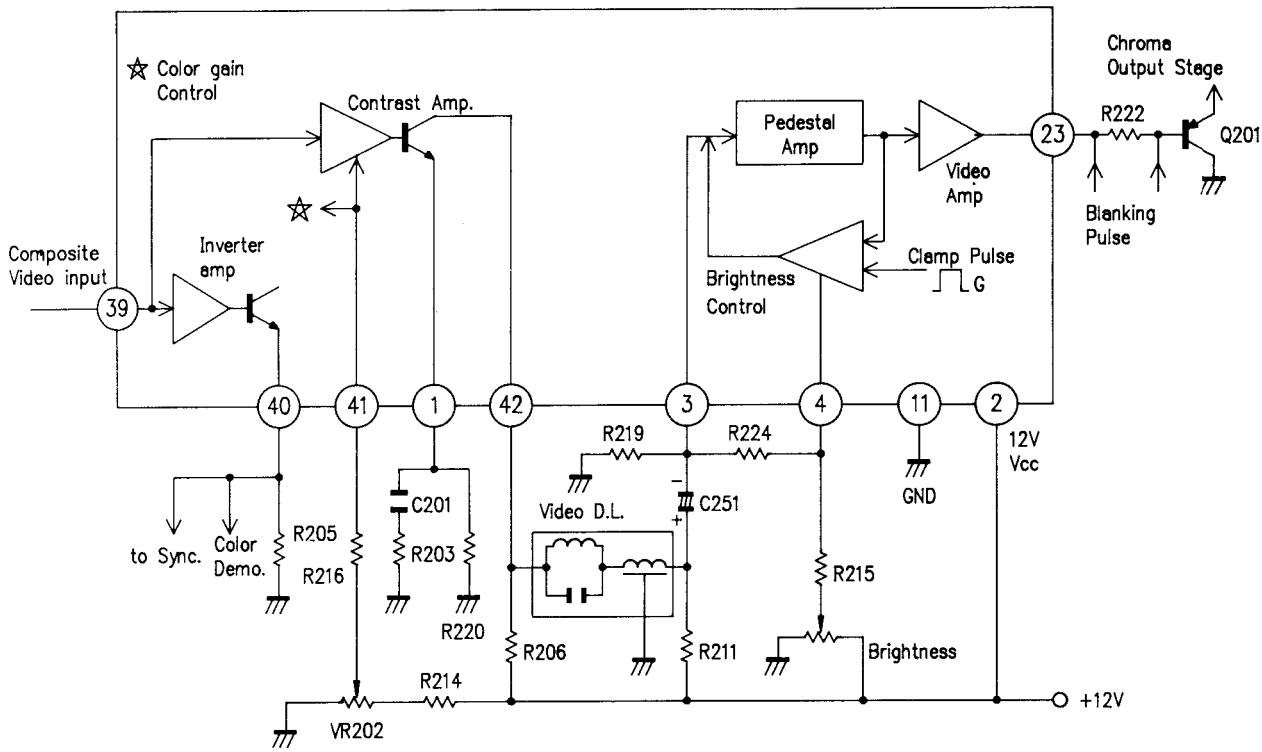


Fig. 13. Video section block diagram.

(1) Inverter amplifier.

The composite video signal with negative going sync is applied to Pin 39 (inverter amp) of IC501 through Z201,Z202 (sound carrier trap), from Pin 22 of IC101. Z201 is a ceramic filter which reduce 5.5MHz beat and Z202 is a ceramic filter which reduce 6.5MHz beat in the picture.

L202 and Z201 form a series resonant circuit tuned to 5.5MHz,6.5MHz. The trap is in shunt with the output (load), furthermore the trap is pratically a short circuit at series resonance.

As a result, the 6.5MHz intercarrier sound is removed from the composite video signal. The frequency spectrum of this trap output is shown in Fig 14.

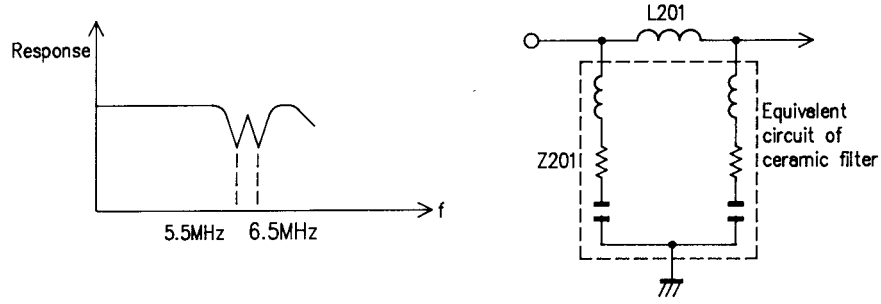


Fig 14. ceramic filter.

Pin 39 is the input terminal, and the operating bias is derived from the DC component of the PIF output. The input dynamic range of Pin 39 is 2.0V to 6.5V typ. Pin 39 is also the input terminal of the contrast amplifier. The output terminal of the inverter amplifier is Pin 40, and the output circuit is emitter follower construction to increase the driving capability. This inverted video output signal is split into two paths one to the sync seperator (R226, R227, R218, C254, C205, C206, D202, Pin 37), and the other to the chroma bandpass amplifier (Pin 5) through a chroma signal taking out circuit (R205, R204, R290, C201, C202, L202). The typical gain of the inverter amplifier is 3.5dB.

(2) Contrast amplifier.

The composite video signal from Pin 39 is also applied to the contrast amplifier, and the output of the contrast amp is input to the base of internal PNP TR as shown in Fig. 13. Pin 1 is an open emitter output and Pin 42 is open collector output of a video signal. A frequency dependent circuit (R220, R203, C201) is connected to Pin 1 to obtain the picture control (peaking control) function. The peaking control produces preshoot and overshoot resulting in faster rise and fall times of the video transients. Excessive peaking may increase the noise in the picture as a result of the increase in high frequency content.

Pin 42 collector output is applied to the pedestal amplifier (Pin 3) through a video delay line (X201) with chroma subcarrier trap (4.43MHz) to compensate the group delay difference between the chroma signal and the video signal. In other words, it is necessary to equalize the delay between the luminance channel(Y) and the narrower band chrominance channel(C) so that they have the correct time relationship at the picture tube.

The time delay inserted is about 0.6–0.75 usec. Without this delay for the Y signal, the color information would be out of register. So the two signals will not be exactly superimposed.

Pin 41 is the control terminal of the contrast control.

The minimum 40dB contrast control range is obtained by Pin 41 DC voltage change 2V to 10V. The more the DC voltage increases, the more contrast gain is high. The contrast control also controls the color saturation, so it is referred to the "Uni–color" control.

(3) Pedestal clamp amplifier.

The output video signal from the contrast amplifier (Pin 42) is applied to the pedestal amplifier (Pin 3). The brightness control and the DC restoration (pedestal clamp) functions are in this stage. Pin 4 is the brightness control terminal. The pedestal clamp means keeping the pedestal level of the video signal at the DC constant voltage of Pin 4. So the pedestal control determines the sensitivity to black and dark gray. For instance, if the voltage of Pin 41 is increased, the black level goes high. Conversely, the black level goes low as this voltage is decreased. The typical gain of the pedestal amplifier is 12.6dB.

The DC restoration ratio is variable by superposing the video signal of Pin 3 to Pin 4 brightness control terminal, so it is determined by the R224 value. The brightness control stage requires the clamp pulse which is synchronized with the pedestal portion.

This clamp pulse (gate pulse or burst keying pulse) is made by the gate pulse generator circuit included within TA7698AP. (It is necessary to have the burst gate pulse open the burst gate only during the burst period regardless of the phasing of the horizontal time base. This will be described later in detail.)

(4) ABL (Automatic Brightness Limitling).

The ABL function is realized also by Pin 4. The ABL operation controls the maximum power dissipation of the receiver and protects the tube from developing purity errors associated with mask distortion due to the excessive heating. When CRT beam current flows excessively, the voltage drop across R208 is increased and then the decreased voltage across R424–C415 is feedback to Pin 4. So the beam current is limited by controlling the black level.

(5) Video output amplifier.

The processed video signal which is contrast/brightness controlled is fed to Pin 23 (–Y output). The maximum output amplitude of Pin 23 is 7.5Vp–p typ. An PNP transistor (Q201) is connected between Pin 23 and the chroma output stage to minimize a switch–on drifting that may be caused by the thermal capacity difference between the IC and the chroma output TR's (Q501–Q503).

The video signal is blanked by applying the vertical pulse via D302 and the horizontal pulse via D412 to the base of Q201. D206 is conducted whenever each blanking signal is appeared, so 12V is applied to the base of Q201.

Consequently, the video signal is blanked because Q201 is turned off.

And then the −Y signal of Pin 23 is finally applied to the emitter of R.G.B output TR's (Q501−Q503) through Q201.

(6) CRT drive stage.

The CRT drive stages are conventional−they are emitter driven for the wideband luminance signal (grounded base) and base driven for the narrow band chrominance signal (grounded emitter). The luminance (−Y) signal is brought into the emitters of the three output stages through the R and C, and the chroma difference signals are applied to the bases of the three output stages.

The gain of each stage can be controlled by the adjustable emitter resistors (VR502−VR506) although the set−up procedure ensures that at least one stage will be operating at its maximum gain setting.

For complete independence of the set−up controls, the three emitters must be at the same DC potential. Since the base−emitter voltage drops will be the same or within very close limits, it follows that the DC outputs from the chrominance demodulator (IC501) must also be held to close limits. The fixed emitter resistors (R513, R517, R518) are by−passed by a small capacitors (C514, C515, C516) to provide some frequency compensation for Q201 emitter RC time constant.

The use of a higher load resistor is now possible requiring less power than earlier designs for the same gain and bandwidth, so no additional heat sink for each output TR's is required at the collector tabs.

This P-54S series chassis has the service swithch (SW201).

The purpose is to help in making adjustments for the picture tube.

There are usually three settings.

1. Normal position : This is the operating position of the switch, with a normal picture on the raster.
2. Purity check position : In this position, Y signal is applied to the red out TR (Q503). So it's very easy to confirm the purity adjustments conveniently.
3. Service position (for white balance adjustment) : In this position, the vertical deflection is disabled to collapse the raster into one horizontal line across the screen. The purpose is to concentrate the illumination to help determine visual cutoff when adjusting the screen grid voltages of the CRT. Screen volume mounted on the FBT varies the screen grid voltage for each of the electron guns. The purpose is to make them all have the same cutoff characteristics at a very low light level.

   And then adjust the white balance, rotating the low light volumes (VR502−504) slightly to the right.

After finishing screen adjustments, put the service switch to the normal position, and then adjust the R,B drive volumes (VR505, VR506).

Drive control adjustments vary the amount of Y signal for each of electron guns, and it's for different phosphor efficiencies of the CRT. The drive volumes are adjusted to produce white highlights in a monochrome picture.

7. Chroma section.

The internal block diagram only for the chroma processing is shown in Fig. 15.

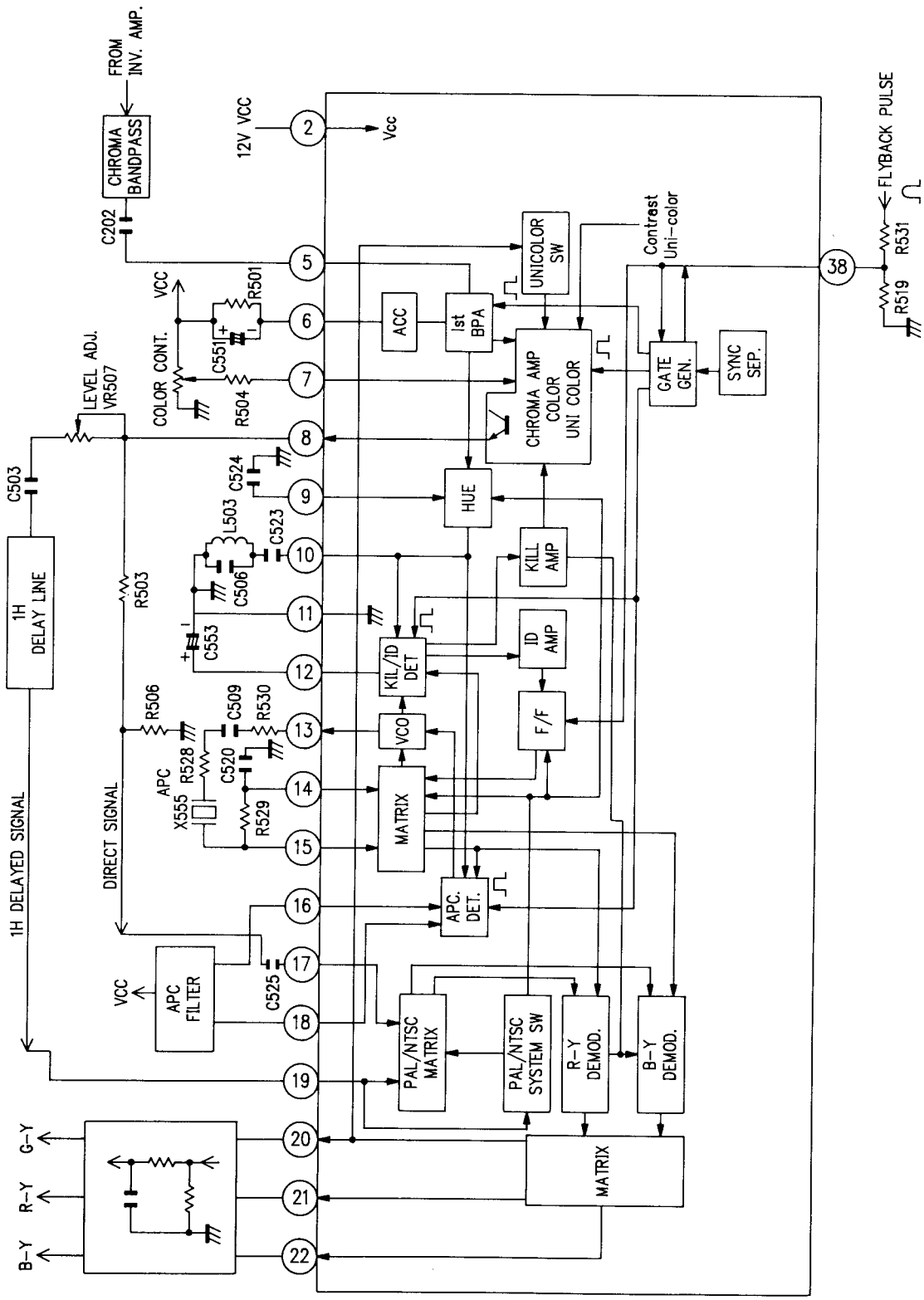


Fig. 15. CHROMA SECTION BLOCK DIAGRAM

(1) The 1st chroma bandpass amplifier/ACC.

The inverted video signal from Pin 40 is applied to a chroma bandpass filter (R205, R204, R290, C204, C202, L202) to take out the chroma information, and then the chroma signal (4.43MHz) is applied to Pin 5 (chroma bandpass amplifier input) which is biased internally.

The 1st chroma amplifier detects amplitude of the burst signal gated from the chroma signal by the burst gate pulse, and controls it's gain to obtain the constant burst signal level of chroma output by ACC(Automatic Chrominance Control) circuit. The burst input level of Pin 5 is 120mVp-p. A typical ACC charecteristics is shown below. When the strength of signal fluctuates, the level difference between luminance and chrominance can cause the variation. The ACC is provided to prevent such a trouble.

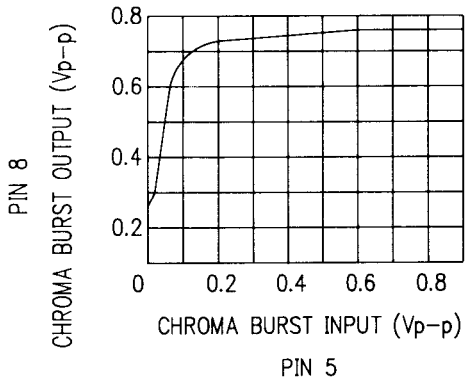


Fig. 16. ACC Characteristics

Pin 6 is the ACC time constant terminal to detect the burst amplitude and to filter the detected output.

R501 and C551 determine the ACC time constant.

The ACC circuit controls the gain of the 1st chroma amplifier in accordance with signal strength, so that the amplitude of the burst signal is maintained at a constant amplitude at the input to the chroma amplifier. Therefore, the ACC system maintains a constant amplitude burst signal at the output for any given setting of the color control.

(2) Chroma amplifier.

The output from the first chroma bandpass amplifier is internally fed to the chroma amplifier.

The gain of the chroma amplifier is determined by the DC voltage at Pin 7. VR501 is the color control volume that varies the amplitude of chroma signal to the demodulators.

This chroma amplifier output is coupled to the color demodulator inputs of Pin 17 and Pin 19 through Pin 8 and the 1H delay associated circuit.

Pin 8 is an emitter follower output terminal of a chroma signal, of which burst component is drawn out by the burst gate and the color saturation level is controlled by the color control and the uni-color control. The chroma output of Pin 8 is applied to Pin 17 (direct signal input) through R503 and C525, and to Pin 19 (delayed signal input) through the 1H delay associated circuit.

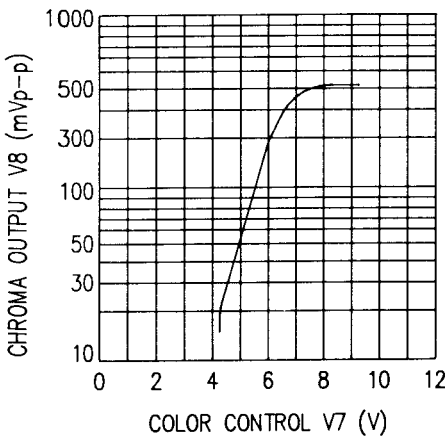


Fig. 17. COLOR CONTROL CHARACTERISTICS.

The control characteristics of chroma output is shown beow.

The amplitude and the phase relation of these two chroma signal are adjusted by VR507 and L504.

The 1H delay line (X501) is provided to supply signals for the internal adders, so that the chroma on a past line through the delay line can be combined with that on the present line, which is directly fed.

(3) Color Killer/Ident detector/Flip-flop.

Detecting the burst signal level, the killer detector switches off the operation of the APC (Automatic phase control) and the chroma demodulator (forced B/W mode) when the burst level is lower than the designed value.

So to speak, in case of the weak signal reception or B/W broadcasting, the killer detector controls the gain of chroma amplifier to zero, so that the picture is forced to be only black and white. Therefore, the color killer depends on the presence or absence of burst signal. In this case, the chroma circuits must be killed because high frequency components of the monochrome signal can be demodulated to produce color at vertical edges in a black-and-white picture.

And also the ident detector normalizes the phase of the flip-flop driven by the horizontal flyback pulse when in PAL mode.

Pin 12 is the terminal of a time constant of the killer and indent detector, and the DC level to the detectors. C553 at Pin 12 is provided for the detector filter.

When receiving the B/W signal, the DC voltage of Pin 12 is 8V typ..

When the color signal is received, this DC voltage increases and killer operation is released. When there is a disagreement between the PAL burst phase alternation and the flip-flop phase, the DC voltage of Pin 12 decreases and the ident detector normalizes the flip-flop to correct the chroma demodulation.

The burst cleaner (a tank circuit tuned to the chroma subcarrier frequency) at Pin 10 is connected to the inputs of the detectors to feed a clean burst signal to the detectors.

And it is accomplished to keep a constant phase shift between the chroma signal and the burst signal by the C-trimmer(C506) alignment.

8. Deflection section.

The internal block diagram only for the deflection is shown in Fig. 18.

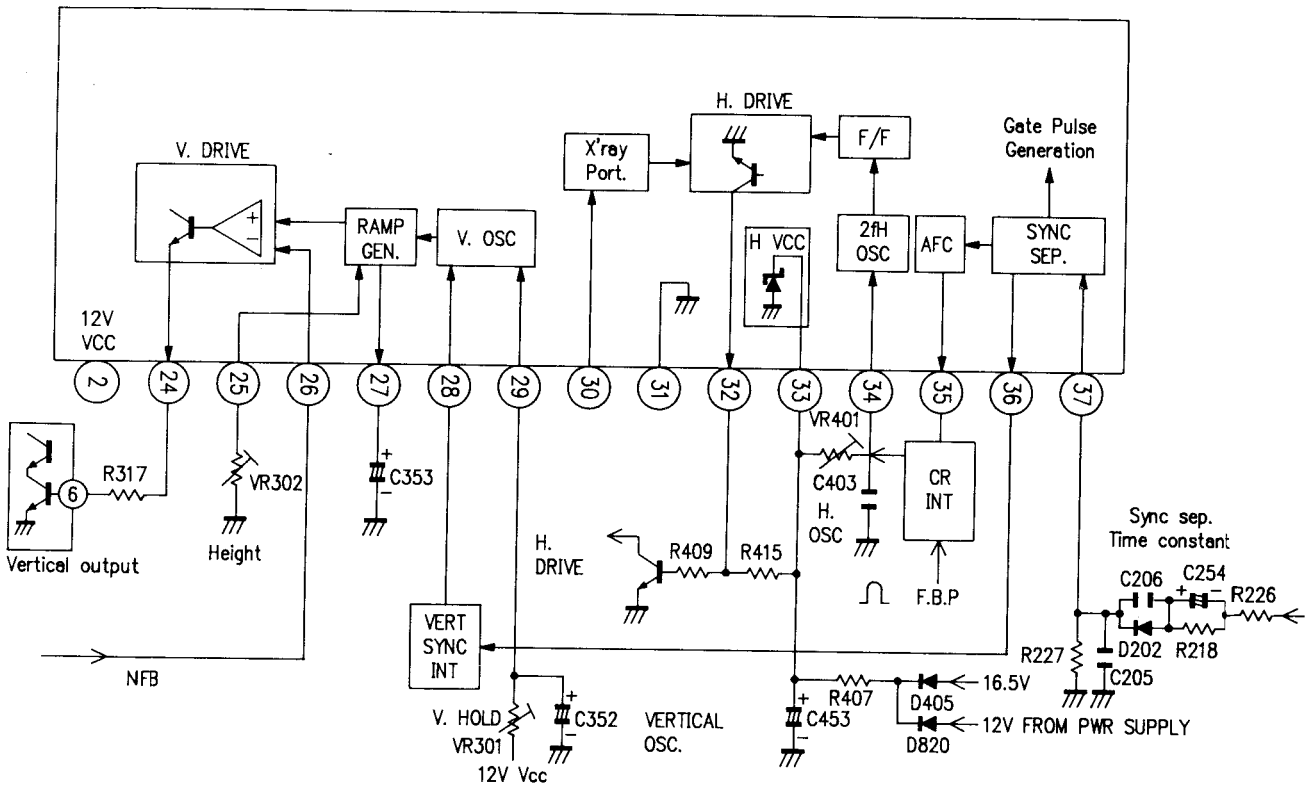


Fig. 18. DEFLECTION SECTION

The deflection section of the TA7698AP (KA2154) includes a sync seperator, a sawtooth type horizontal AFC, a horizontal oscillator, a horizontal pre-driver, a vertical oscillator and a vertical pre-driver.

The GND line of this section is seperated to the other, but the Vcc line except the AFC and the horizontal section is common to the other sections.

(1) SYNC seperator.

Pin 37 is an input terminal of the base-time constant type sync seperator. The positive-going video signal from Pin 40 (inverter output) is applied to Pin 37 through a sync seperator time constant circuit. The slice levels of the horizontal sync and the vertical sync can be set independenty as described in Fig. 19.

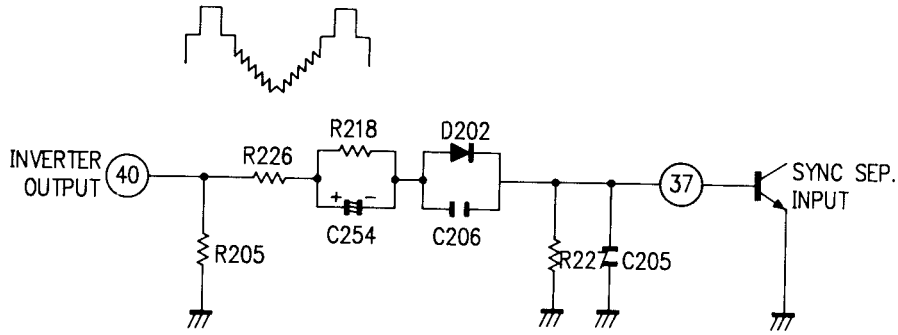


Fig. 19. Sync seperator.

R205 ----------Pin 40 load resistor

R226, R227, C206 ----------Determines horizontal sync slice level

R226, R218, R254 ----------Determines vertical sync slice level

D202 ----------Vertical and horizontal time constant separation

C205 ----------Noise filter/Gate pulse rising edge timing

To deepen the slice level ;
Horizontal : R226 increase or R227 decrease
Vertical : R226 increase or R218 decrease

The values of these input components are determined to obtain the excellent stability of the sync seperation.

Pin 36 is the output terminal of the sync seperator, and also this terminal is used as a time constant of the internal gate pulse generation.

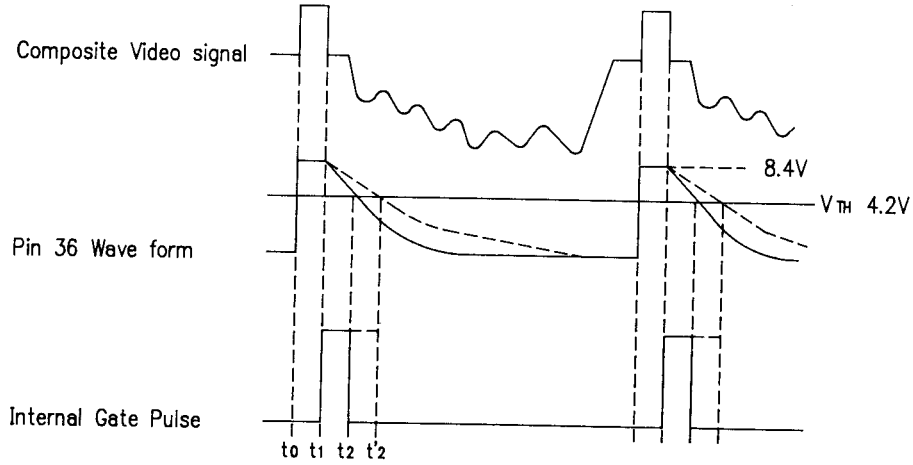


Fig. 20. The waveform at Pin 36.

The rising edge of the gate pulse (t1) is determined internally but little adjustment is possible by the change of C205 connected between Pin 37 (sync seperator input) and ground.

The falling edge of the gate pulse (t2) is determined by an external integration time constant connected to Pin 36 (This time constant is also for integration circuit of the composite sync output to obtain the vertical sync signal).

The gate pulse generated here is masked by the flyback pulse from Pin 38, and is internally applied to the pedestal clamp circuit and the burst gate circuit. The vertical sync output at Pin 36 is fed via the integrator circuit (R301, C310) to the vertical oscillation.

(2) Horizontal AFC circuit.

The TA7698AP (KA2154) adopts a sawtooth wave type horizontal AFC (Automatic Frequency Control). A form-shaped horizontal flyback pulse which comes from Pin 1 of the fyback transformer (T444) through R405, C452, C405 and R412 is input to Pin 35 and is compared to the horizontal sync signal, and the phase difference (frequency difference) is fedback to Pin 34 (horizontal oscillator) so that the flyback pulse will have the same timing as the sync pulse.

The ripple wave of Pin 35 (AFC phase detector output) is integrated by an external CR circuit (R410, C404), and this filtered error voltage (DC) is fed to the horizontal oscillator and changes the oscillator frequency by the amount necessary to make the scanning frequency the same as the H-sync frequency.

Pin 35 is an input-output terminal for the AFC.

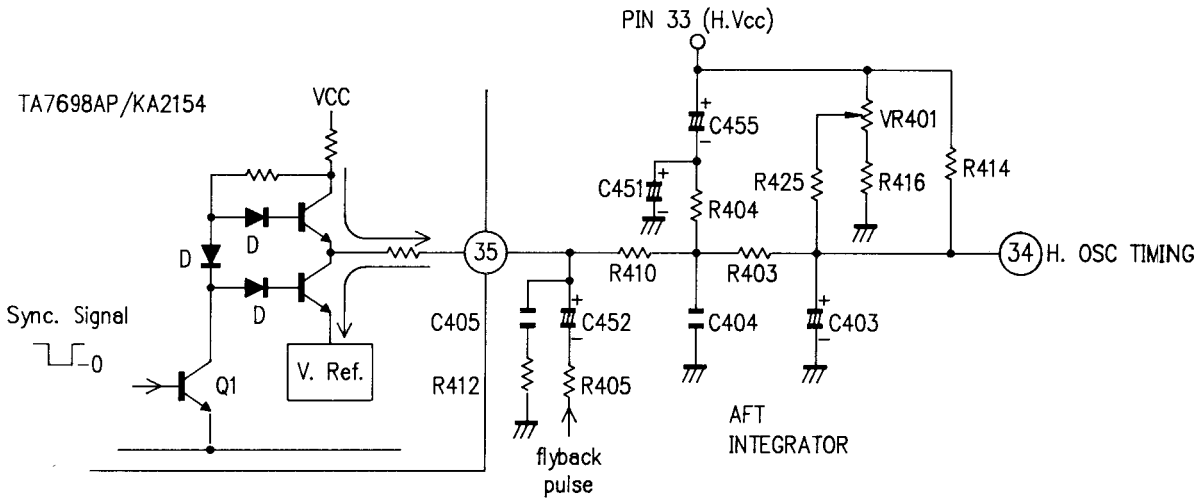


Fig. 21 AFC CIRCUIT

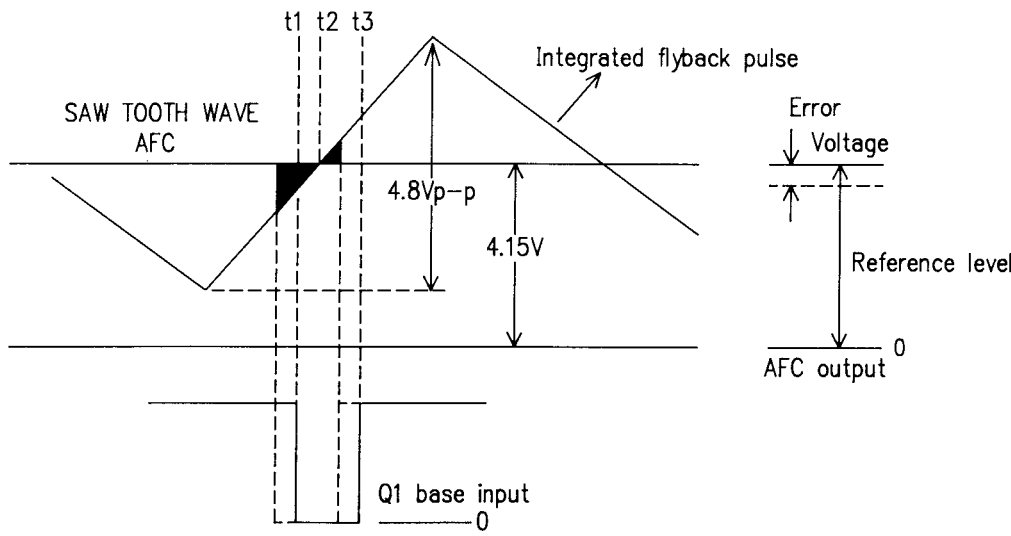


Fig. 22 AFC operating wavefrom

(3) Horizontal oscillator/Horizontal pre-driver.

The horizontal oscillation starts to operate when H-Vcc at Pin 33 reaches to 4.0V, and is performed by the charge and discharge of C403 as shown in Fig. 23. The horizontal oscillator generates 2 times of horizontal frequency, and is controlled by the AFC circuit.

Pin 34 is a terminal for the oscillator time constant.

Horizontal sawtooth voltage is obtained as the voltage across C403 that is alternately charged slowly and discharged fast.

C403 is charged by H-Vcc (8V) through a high resistance (VR401, R425 and R414) for a long time constant. The charging produces a linear rise of voltage across C403 for the trace part of the sawtooth wave. Conversely, C403 is discharged through the internal R_D for a relatively fast time constant.

When the voltage at Pin 34 builds up to the high threshold level (V_H) of the voltage comparator inside IC501, the switching circuit of Pin 34 is turned on, and at the same time, the threshold level is switched to V_L. Then the voltage across C403 has discharged down to the low threshold level through the internal R_D.

As soon as the voltage across C403 reaches to the low threshold level, the internal switching circuit is turned off, and the threshold level is switched to V_H. Therefore, C403 starts recharging again from H-Vcc (8V). Such a step is continued repeatedly.

The free-runing frequency is adjusted by varying the charge resistor (VR401).

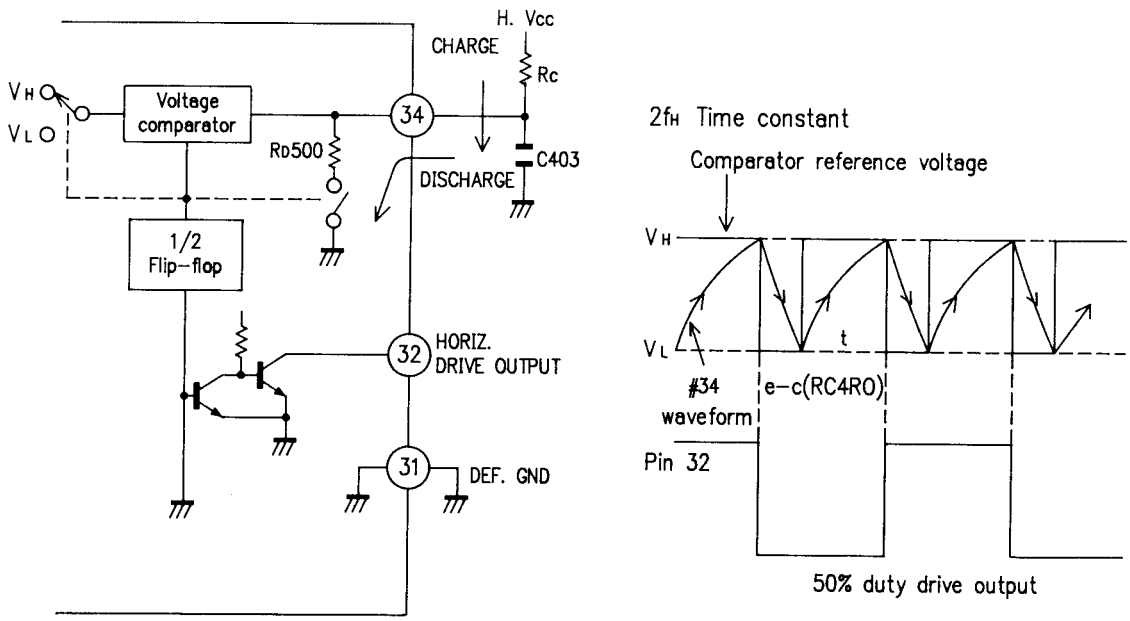


Fig. 23. Horizontal oscillator and pre-driver.

The $2f_H$ frequency is divided into 2 by a flip-flop circuit, and the f_H is applied to the horizontal pre-driver inside IC501. The horizontal drive output of Pin 32 has exact 50% duty cycle.

This system realizes excellent interlace performance.

The rated sink current of the open collector output (Pin 32) is 30mA peak.

The horizontal drive output is applied to the base of the horizontal drive TR (Q402). L404 and C406 are provided for reducing the high frequency radiation because this line is a large f_H current path.

(4) Horizontal Vcc.

As described previously, the supply voltage of the horizontal section is applied from a zener type voltage regulator as shown in Fig. 24.

When a TV set is switched on, some supply current which is required to start up the horizontal section is supplied from the 12V line of the power supply, and then an internal flyback pulse power supply (16.5V) is activated and supports the supply current of the horizontal section.

The internal zener voltage is 8.2V typical, D405 is for the seperation between these two power supplies.

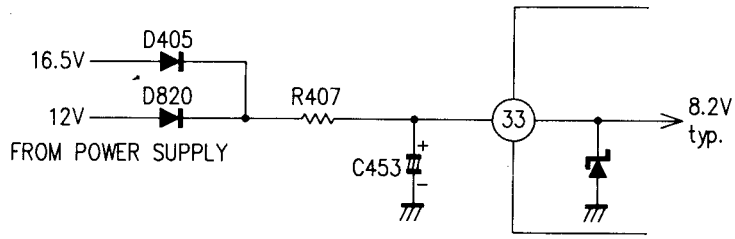


Fig. 24 Horizontal Vcc.

(5) Horizontal drive and output.

The horizontal drive transistor (Q402) is a buffer or isolation stage to prevent the output circuit form changing the oscillator frequency and to shape the driving voltage for the output stage.

After the oscillator pulse from Pin 32 is amplified and inverted by Q402, this output of Q402 is applied to the base of Q404 through the horizontal drive transformer (T401). With the HDT (T401), the voltage drive is stepped down to match the low impedance of Q404. The function of Q404 is equivalent to that of an ON-OFF switch. Q404 conducts for the right half of the picture while the damper diode builted in Q404 conducts for the left half of the picture, so that the complete horizontal scanning can be performed.

The high voltage pulse produced across the primary winding of FBT is used for the generation of the various supply voltage. This flyback pulses are rectified and filtered to provided anode voltage of 23KV-25KV for the picture tube, 175V for the video output stage, 24V for the vertical output IC, and 16.5V for the other IC and tuner. Anode voltage for the CRT is coupled from the primary winding to a secondary winding which consists of a section utilizing 3 coils and 3 diodes in a series arrangement. The high voltage is derived by elevation on each set of windings. For example, the first winding will pick up an 8KV pulse, and this pulse will be rectified by the diode off the top of the winding.

This action will give approximately 8KV DC. Now, following through the next winding, you will have 8KV DC plus another 8KV pulse. When this 8KV pulse is rectified, you now have 16KV DC. Going through the next winding, you now have 16KV DC plus another 8KV pulse. The top diode rectifies 8KV pulse and now you will have approximately 24KV DC. With the loading effect, we will come out with the correct high voltage for the appropriate picture tube size.

Note that the horizontal deflection coils are in parallel, for a lower impedance than with series connections.

(6) Vertical oscillator.

The composite sync output from Pin 36 is integrated by the external time constant (R301, C310) to obtain the vertical sync signal, and the sync signal is applied to Pin 28 (vertical sync terminal) through the DC blocking capacitor (C351) and triggers the vertical oscillator.

The vertical oscillator is also an CR charge-discharge type as same as the horizontal oscillator. The vertical sync pulse retriggers the oscillation and pull in the frequency to vertical frequency (fv).

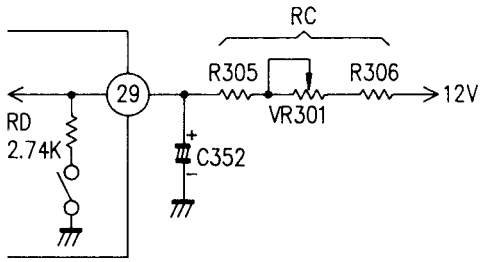


Fig. 25. Vertical oscillator.

Pin 29 is for the oscillator time constant. The discharging resistor (RD) is included in the IC. The vertical retrace time is determined by the time constant : C352 x (RC// RD).

The oscillation output is internally fed to the ramp generator for obtaining the sawtooth voltage.

(7) Ramp generator.

A linear ramp wave is generated by constant voltage charging and constant current discharging a capacitor (C353) connected to Pin 27. The charge-discharge timing is controlled by the vertical oscillator output. The discharging current is determined by R307, VR302 and R308 connected to Pin 25. When rotating the V-height volume (VR302) to the right, the resistance of VR302 is reduced and then V-size decreases.

As the vertical output amplitude is proportional to the voltage amplitude of Pin 27, the output from IC301 Pin 2 is fed back to Pin 25 through R309 for compensating the vertical linearity.

The sawtooth wave generated by the ramp generator is fed to the internal drive block.

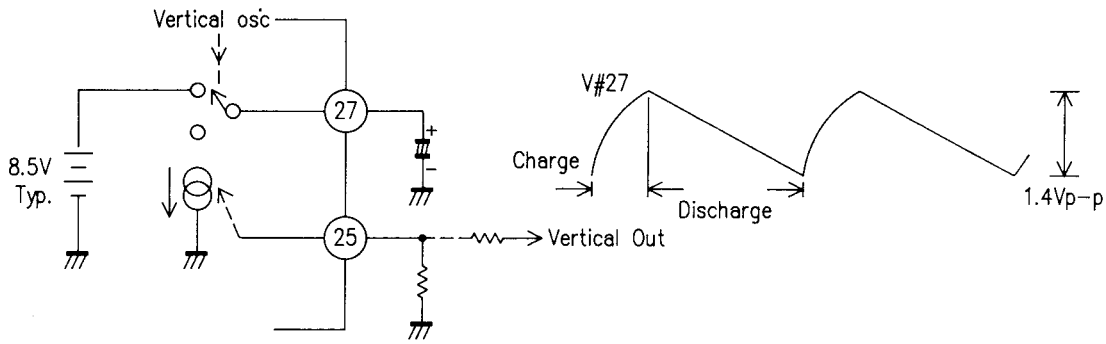


Fig. 26. Vertical ramp generator.

(8) Vertical drive amplifier.

The sawtooth voltage of the ramp generator is amplified in the vertical drive amplifier inside IC501, and then the output through Pin 24 is applied to Pin 6 of IC301 (Vertical output IC).

The vertical output section which is consisted of the vertical drive NFB (Negative Feedback) amplifier of IC501 and an SRPP (Shunt Regulated Push-Pull) output stage of IC301 drives a vetical deflection coil so that the current waveform of the deflection coil will be similar to the ramp waveform at Pin 27.

Pin 26 of IC501 is the AC/DC feedback terminal from the vertical output stage. The DC bias of the vertial drive NFB amplifier is determined by the DC negative feedback to Pin 26 through R312, R313 and R314.

C354 and R310 are provided for AC negative feedback. So to speak, a series resistor (R310) converts the DY current waveform to a similar voltage waveform, and then the output voltage waveform and the output DC component are applied to Pin 26 through a ß circuit (AC/DC feedback circuit).

The ß circuit determines the output current amplitude and the center voltage, so that the linearity of vertical scanning can be compensated by above AC/DC feedback.

Since the limearity control changes the gain of the vertical drive amplifier, it also changes the vertical height.

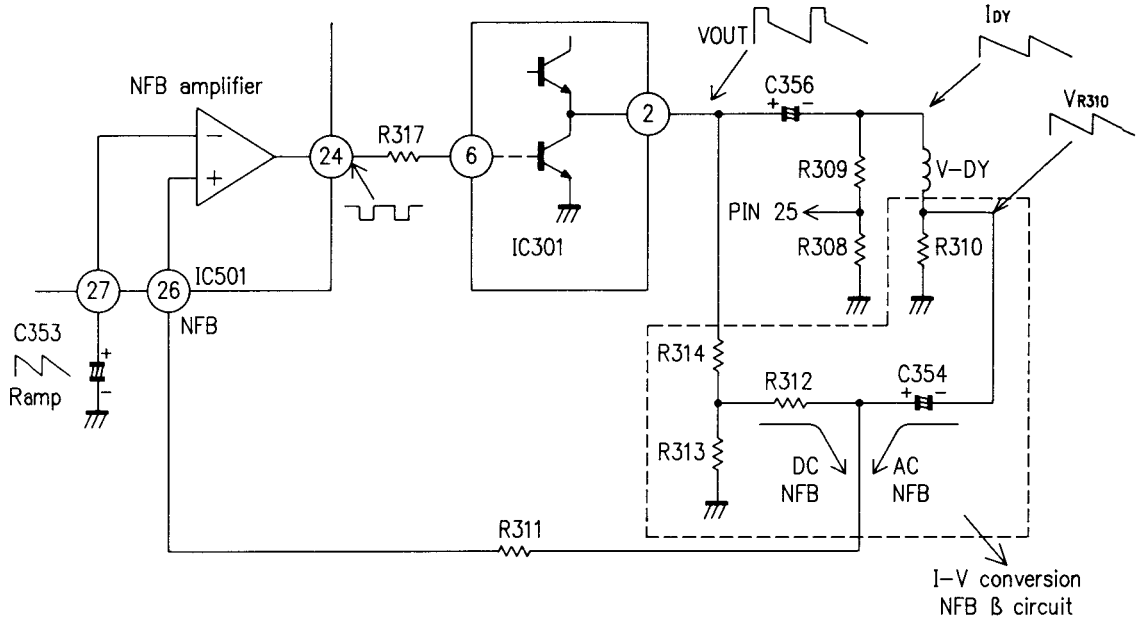
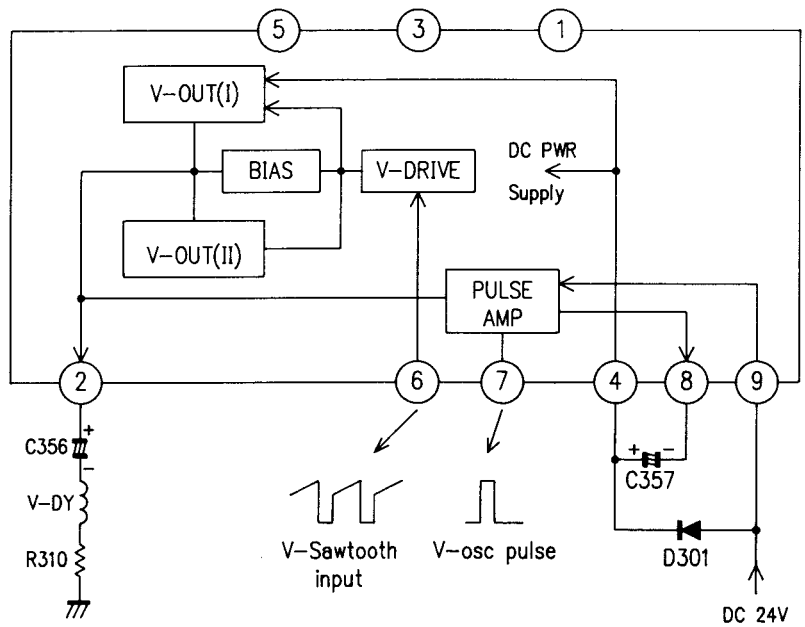


Fig. 27. Vertical section.

(9) Vertical output circuit.

The internal block diagram and waveforms of IC301 (AN5512/KA2131) are shown in Fig. 28.



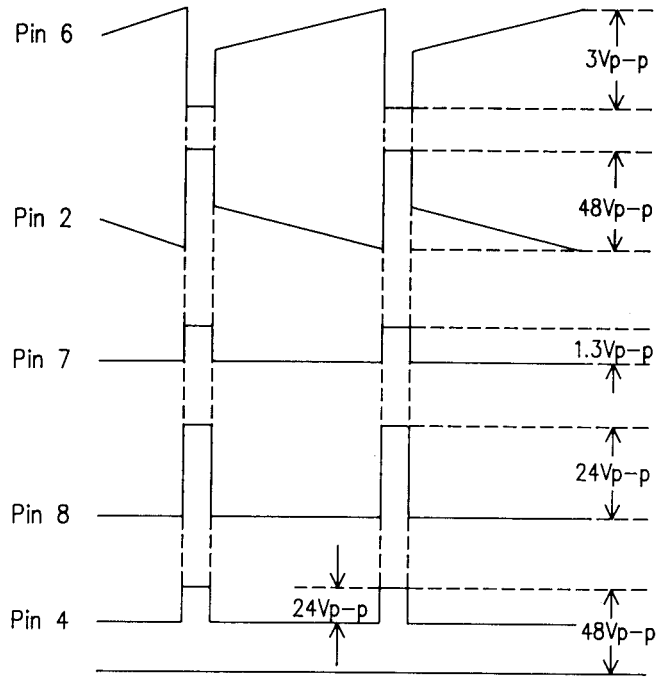


Fig. 28. Internal block diagram & Waveforms.

The vertical output IC (IC301) is mounted on a heatsink and is powered by +24V from Pin 11 of FBT(T444). The sawtooth voltage from IC501 Pin 24 is input to Pin 6 and is amplified in the internal drive stage.

Then this drive output is amplified to supply the required amount of sawtooth current in the vertical power amplifier (SRPP), and drive the vertical winding of DY though Pin 2.

As illustrated in the waveform of Pin 2, the output peak voltage of IC301 is approximately 48 V during the retrace time and 24V during the trace time. Since the vertical pulse superimposed on 24V is Vcc during the retrace time, the power consumption of the vertical output stage is saved.

The principle of this pump-up circuit is as follows.

As the internal pulse amplifier is not operated during the trace time, the voltage of Pin 8 is OV, so that C357 is charged up to 24V. Therefore, at scanning the top half of the raster, the path of the deflection current is 24V line→D301→Pin 4→IC vertical output stage→C356→DY. And at scanning the other half, the path of the deflection current is C356→IC Vertical output stage→R310→DY.

Nextly, when the vertical oscillator pulse is applied to the pulse amplifier of Pin 7, the vertical blanking pulse output of this pulse amplifier is coupled from Pin 8 and is input to the vertical output stage through C357 and Pin 4. Namely, C357 is charged to 24V during trace time, but is charged up to two times of the supply voltage (48V) by the output voltage of Pin 8 during the retrace time. This 48V is supplied via Pin 4 to the output stage as an operating energy during the retrace time. Therefore, the current path during the blanking time is 24V line→Pin 8→C357→IC vertical stage→C356→DY.

C353 couples the vertical scanning signal to the yoke coils and blocks any DC voltage from the vertical scanning coils which would shift the centering of the raster.

The shunt resistor across the vertical deflection coils is builted in the yoke housing, and that function is to prevent ringing at the start of vertical flyback.

* ABSOLUTE MAXIMUM RATINGS (Ta=25℃)

CHARACTERISTIC	SYMBOL	RATING		UNIT
STORAGE TEMPERATURE	Tstg	−55 ∼150		℃
OPERATING TERMPERATURE	Topr	120 ∼70		℃
OPERATING PRESSURE	Popr	1.0±0.6		Kg/Cm^2
SUPPLY VOLTAGE	Vcc	27.6		V
SUPPLY CURRENT	Itot	250		mV
CIRCUIT VOLTAGE	V2−1	0	60	V
	V4−1	0	60	V
	V6−1	0	2.5	V
	V7−1	0	1.3	V
CIRCUIT CURRENT	I_2	−500	500	mA p−p
	I_5	−1.0	1.0	mA
	I_8	−500	500	mA p−p

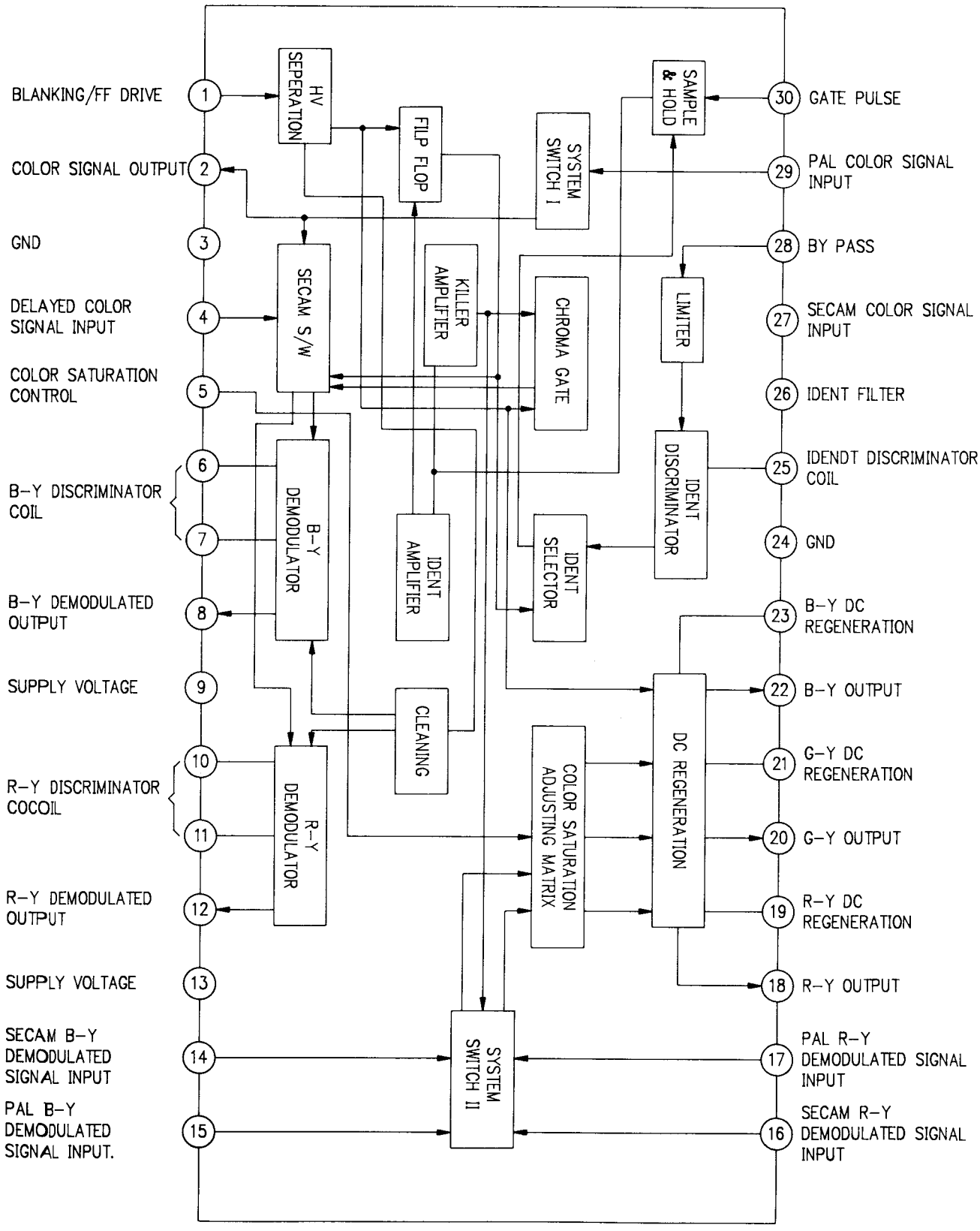
(10) Pincushion correction.

As the screen is not a sperical surface, the beam path becomes longer at the corners of screen, and the deflection gets bigger.

In order to correct this pincushion distortion, T402 and the associated circuit are provided. The pincushion transformer (T402) is in series with the vertical defection coils to modify the scanning with a waveform that compensates for the top and bottom pincushion distortion of raster, and also that provides vertical scanning signal to the left and right pincushion distortion.

The vertical output current is integrated by R315 and C355 so that parabolic current which is synchronized with the vertical frequency can be generated. As the parabolic current corrects the horizontal frequency, less horizontal deflection at the beginning and end of vertical period and more horizontal deflection at the center of vertical period can be performed.

M51397AP BLOCK DIAGRAM



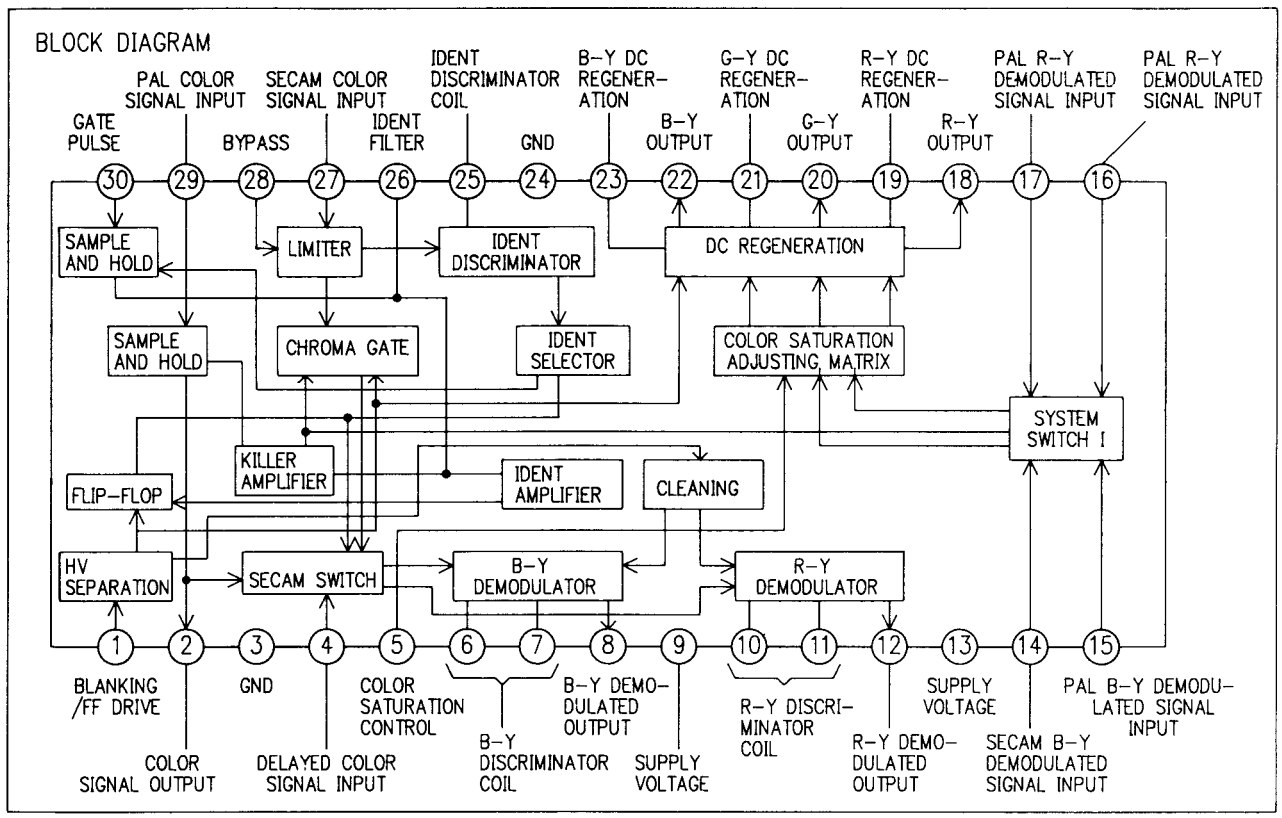
Pin voltage of IC501 (TA7698 P)

Pattern / Pin NO.	SECAM	PAL	Remarks
1	3.9		
2	12.5		
3	4.7		
4	4.7		
5	1.1		
6	10.5		
7	0.8	7.4	
8	10.9		
9	6.2		
10	7.8		
11	0		
12	7.1	9.5	
13	10.2		
14	3.6		
15	3.6		
16	9.4		
17	4.3		
18	9.3		
19	4.3	4.4	
20	7.8		
21	7.7		
22	7.6		

Pattern / Pin NO.	SECAM	PAL	Remarks
23	6.4		
24	0.7		
25	4.1		
26	7.6		
27	7.5		
28	-0.3		
29	2.7		
30	0		
31	0		
32	1.1		
33	8.2		
34	4.5		
35	4.5		
36	1.6		
37	-0.3		
38	0.2		
39	4.8		
40	5.8		
41	7.8		
42	10.4		

* The content of blank marked above is the same as when receiving the SECAM Pattern.

Pin voltage of ICN01(M51397 AP)



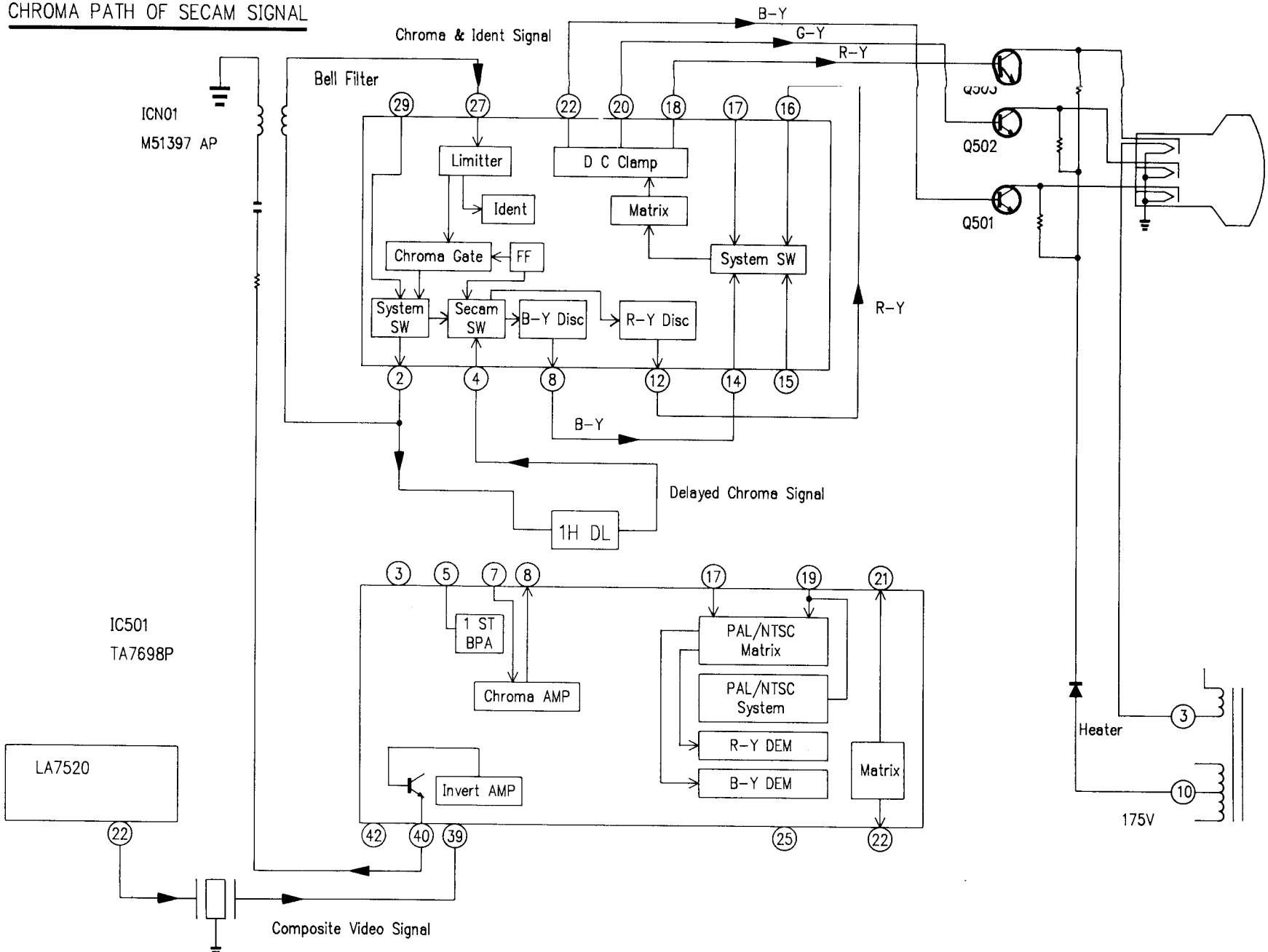
Pin NO. \ Pattern	SECAM
1	3.5
2	5.9
3	0
4	2.8
5	5.7
6	4.1
7	2.5
8	8.1
9	11.9
10	4.1
11	2.5
12	8.0
13	11.8
14	2.8
15	2.8

Pin NO. \ Pattern	SECAM
16	2.8
17	2.8
18	7.0
19	3.7
20	7.1
21	3.7
22	7.1
23	3.7
24	0
25	2.9
26	9.1
27	5.9
28	5.9
29	5.3
30	0.2

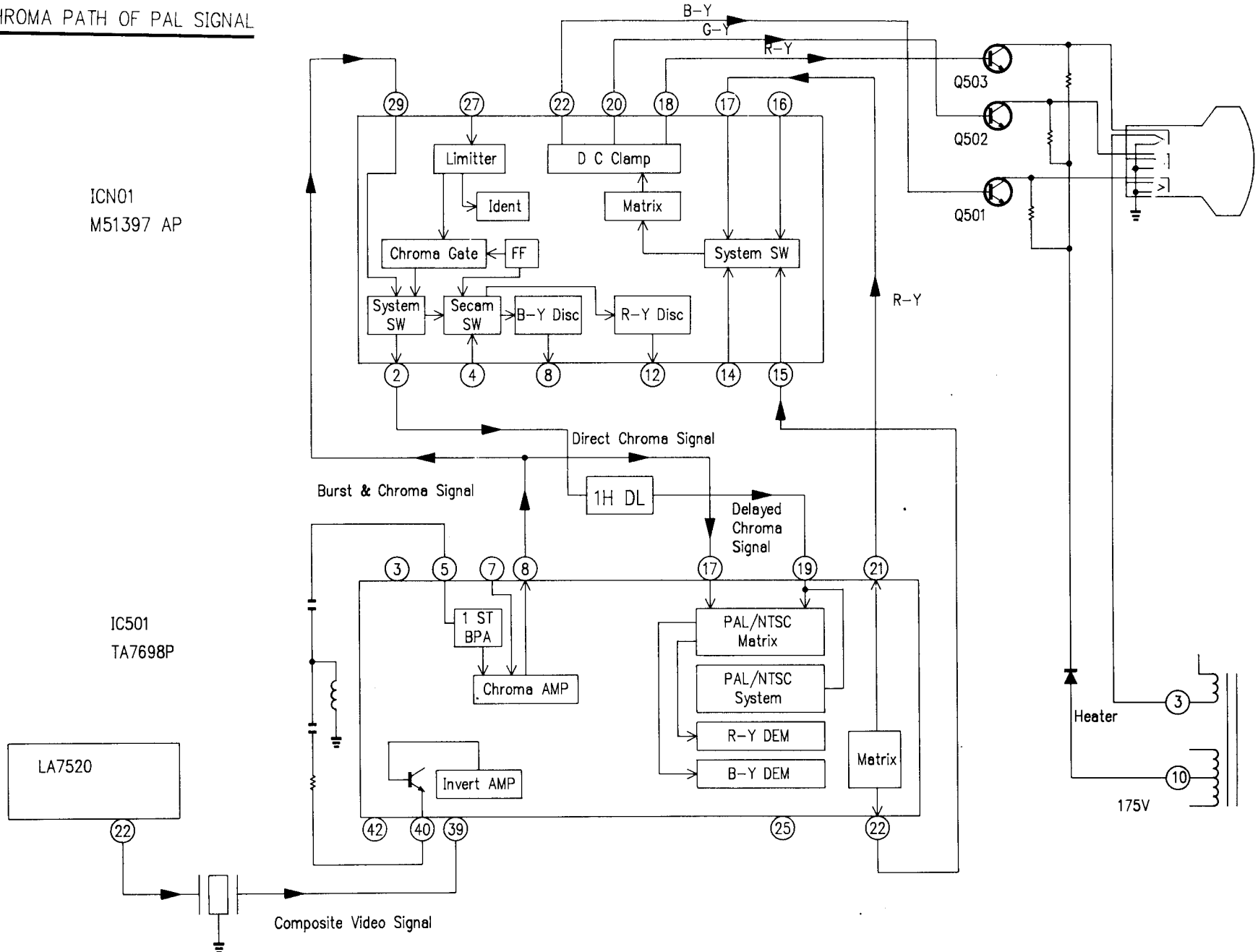
* When receiving the PAL pattern, the voltage of all pins except pin NO4 is the same as when receiving the SECAM pattern.

  In receiving the PAL pattern, the voltage of pin NO4 is zero.

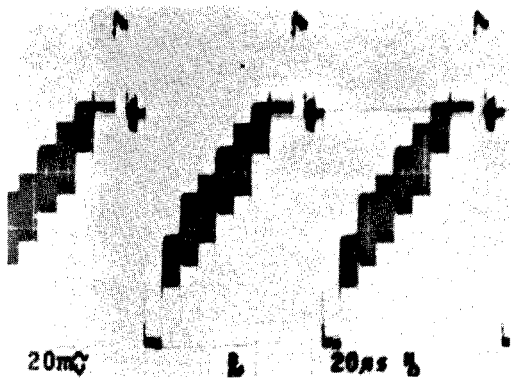
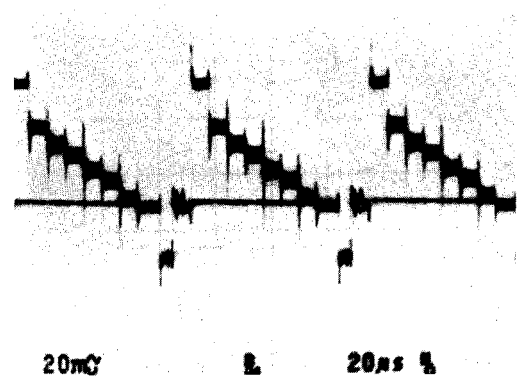
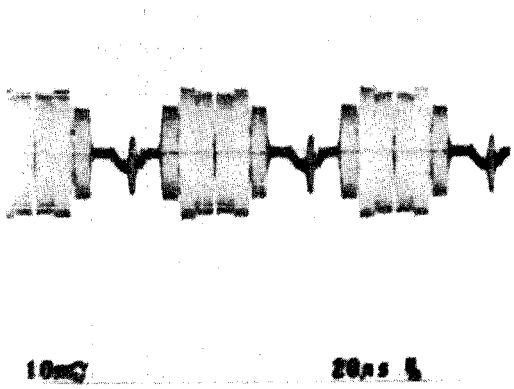
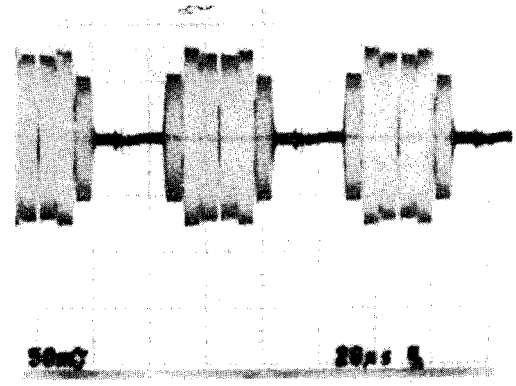
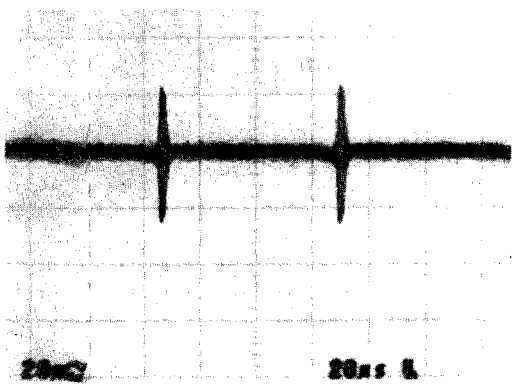
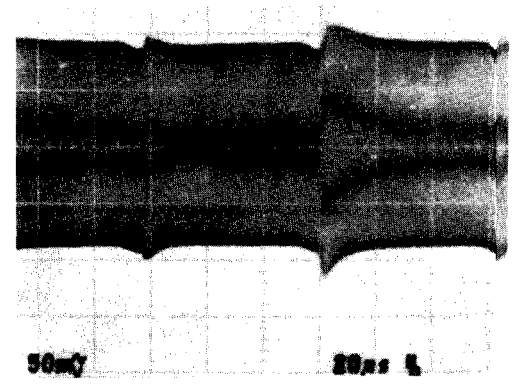
CHROMA PATH OF SECAM SIGNAL



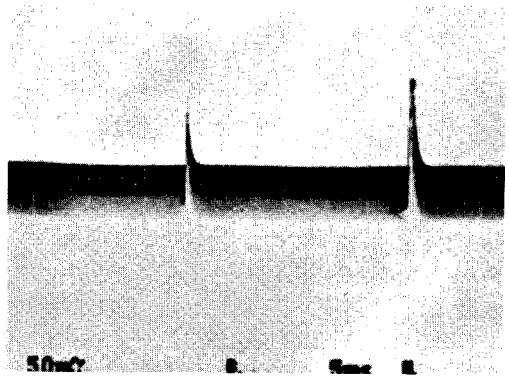
CHROMA PATH OF PAL SIGNAL



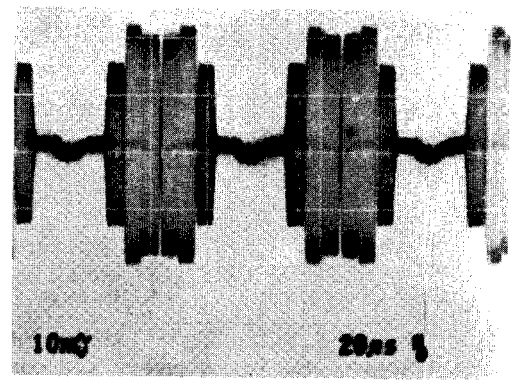
WAVEFORMS(IC501) WHEN RECEIVING 7-STEP COLOR(PAL)

	
① 1.2 V p-p	③ 860 mV p-p
	
⑤ 220 mV p-p	⑧ 1.6 V p-p
	
⑩ 500 mV p-p	⑬ 1.9 V p-p

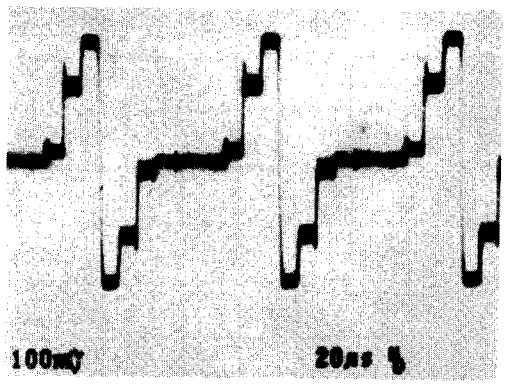
WAVEFORMS(IC501) WHEN RECEIVING 7-STEP COLOR(PAL)



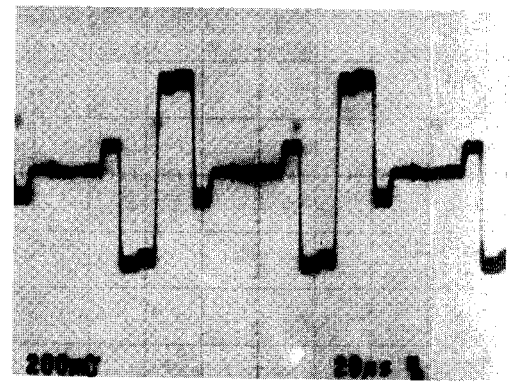
⑯ 1.25 V p-p



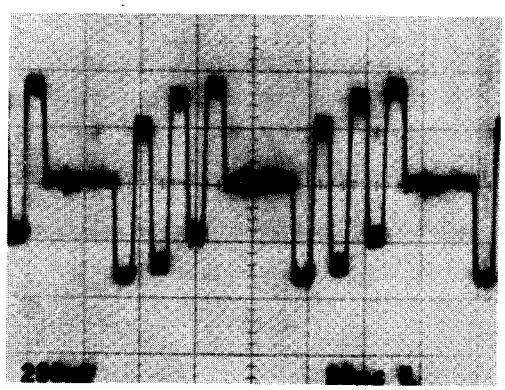
⑰, ⑲ 420 mV p-p



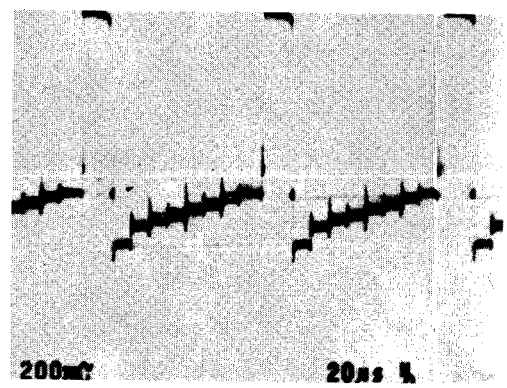
⑳ 4.5 V p-p



㉑ 7 V p-p

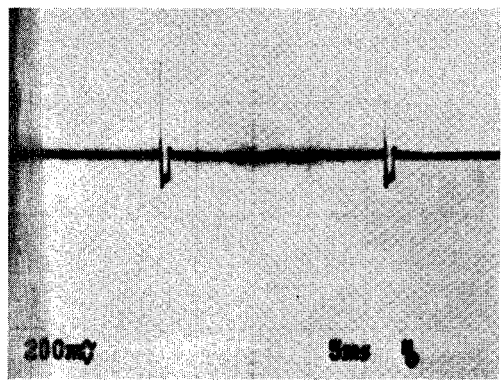
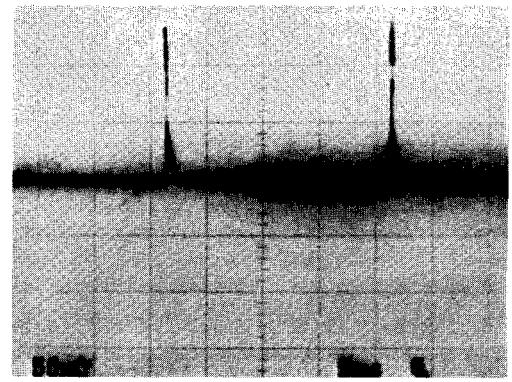
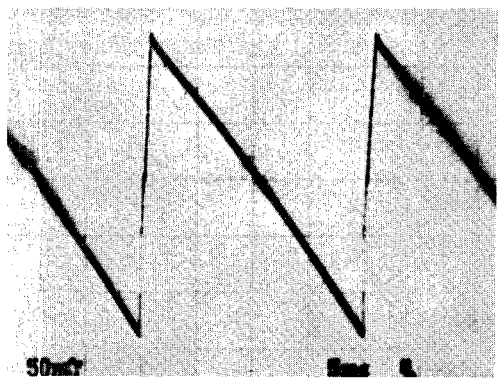
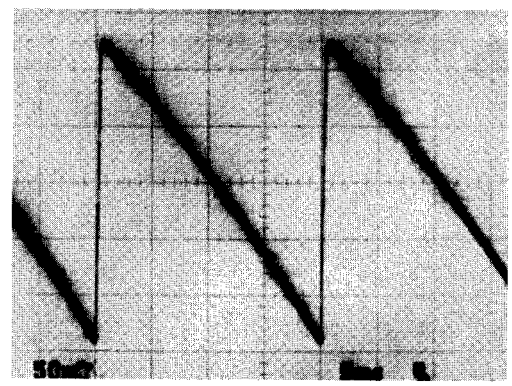
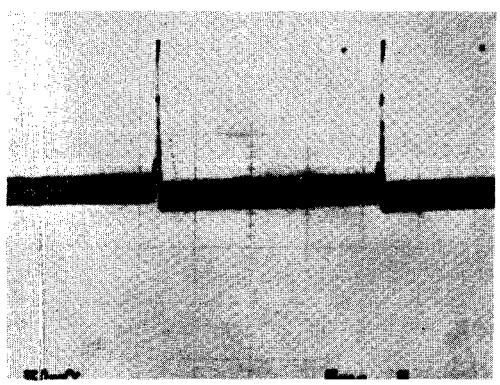
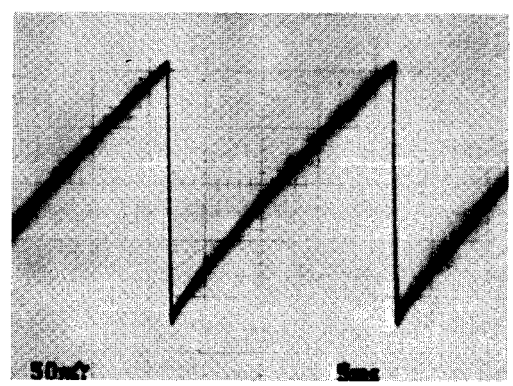


㉒ 7 V p-p

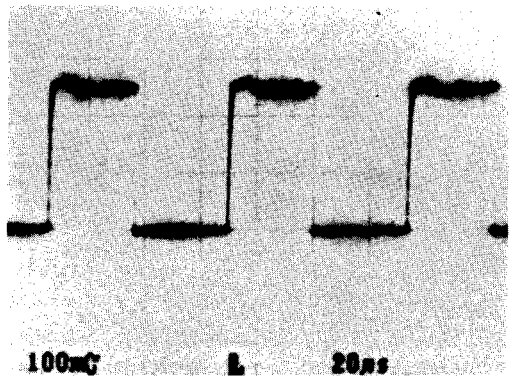


㉓ 9 V p-p

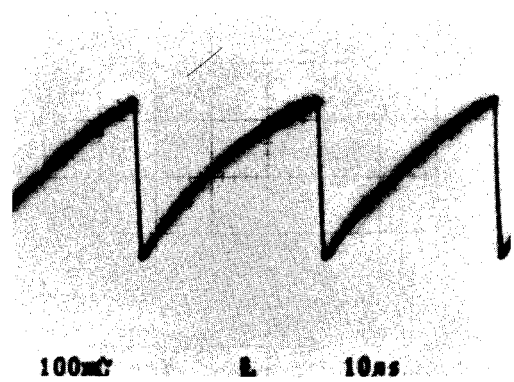
WAVEFORMS(IC501) WHEN RECEIVING 7-STEP COLOR(PAL)

	
㉔ 4.4 V p-p	㉕ 1.4 V p-p
	
㉖ 2.75 V p-p	㉗ 2.75 V p-p
	
㉘ 1.5 V p-p	㉙ 2.15 V p-p

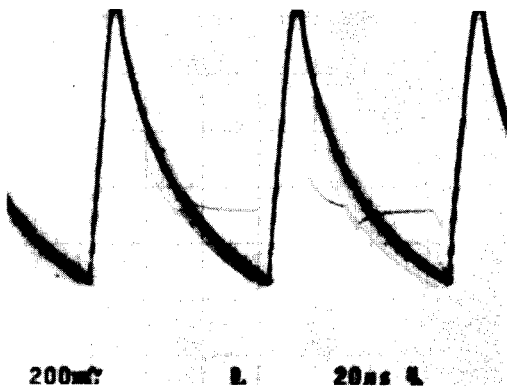
WAVEFORMS(IC501) WHEN RECEIVING 7-STEP COLOR(PAL)



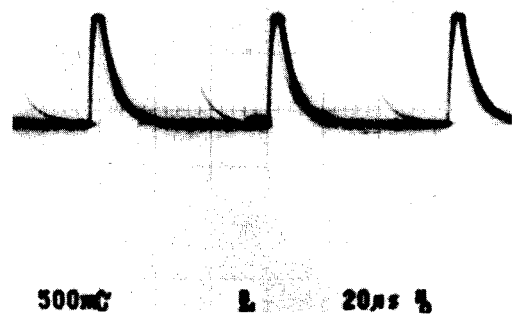
㉜ 2.7 V p-p



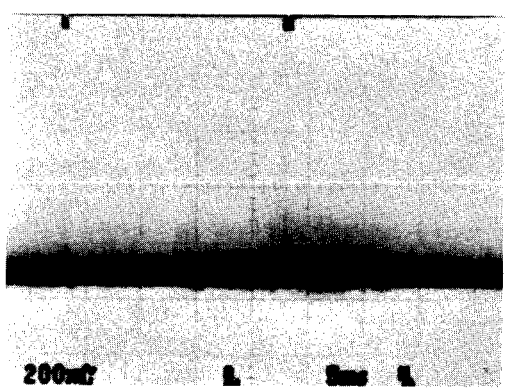
㉞ 3 V p-p



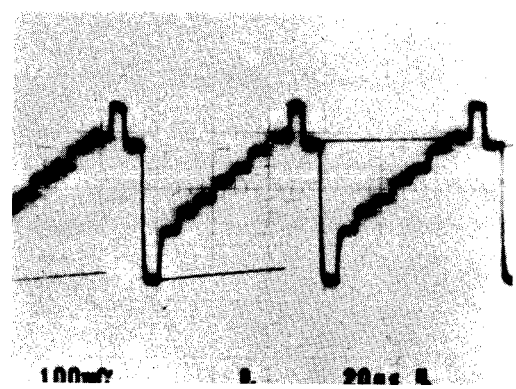
㉟ 10.4 V p-p



㊱ 10 V p-p

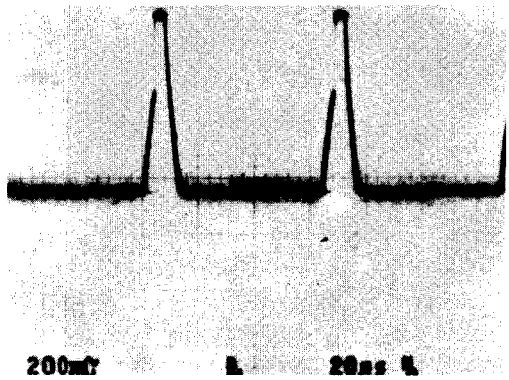


㊱ 10 V p-p (VERTICAL MODE)

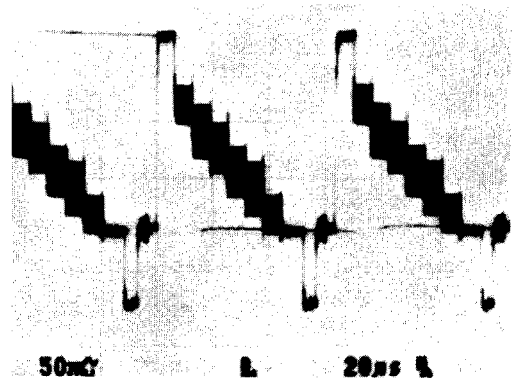


㊲ 3.2 V p-p

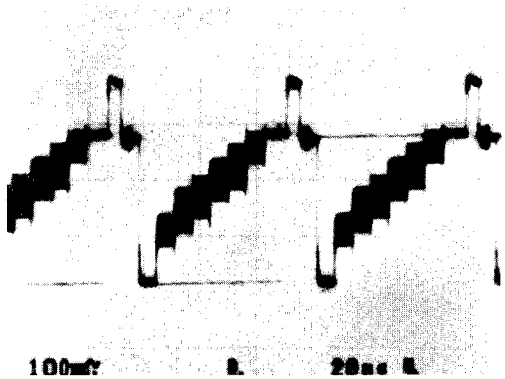
WAVEFORMS(IC501) WHEN RECEIVING 7-STEP COLOR(PAL)



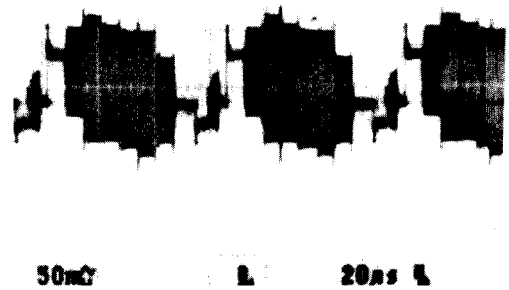
㊳ 6.4 V p-p



㊴ 2.5 V p-p

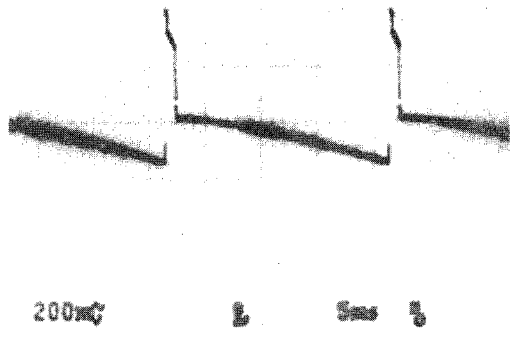
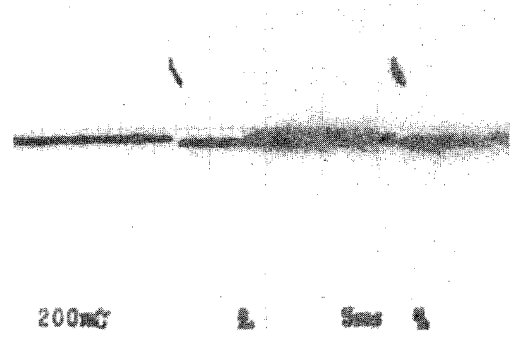
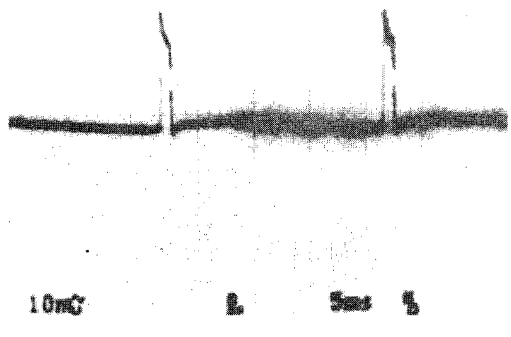
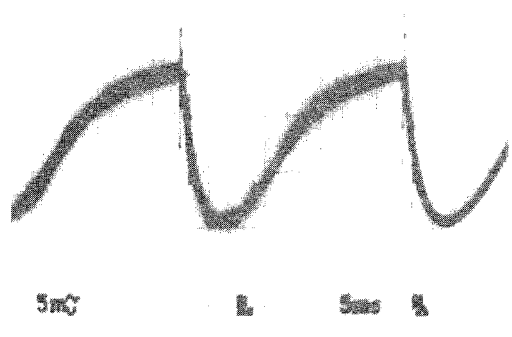


㊵ 3.7 V p-p

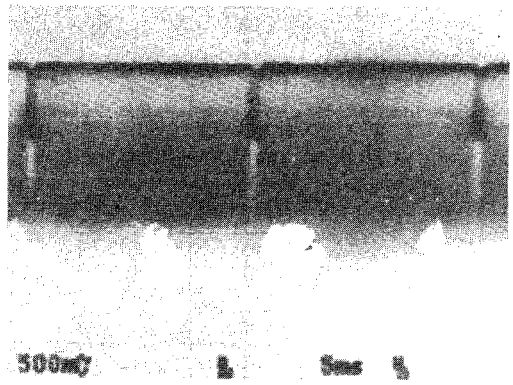


㊷ 1.3 V p-p

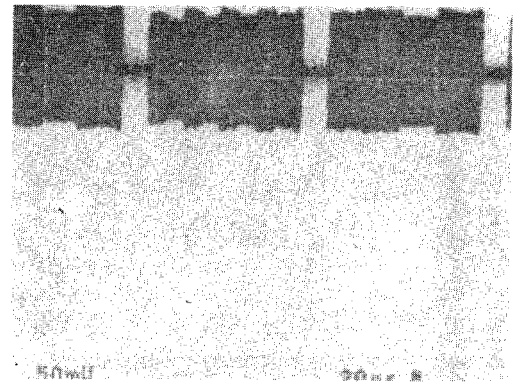
WAVEFORMS(IC301)

	
② 54 V p-p	④ 30 V p-p
	
⑦ 2 V p-p	⑨ 1.5 V p-p

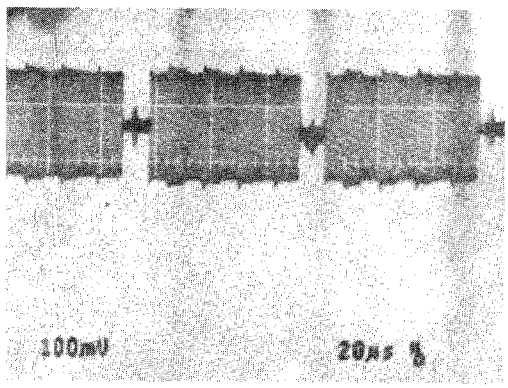
WAVEFORMS(ICN01) WHEN RECEIVING THE SECAM SIGNAL



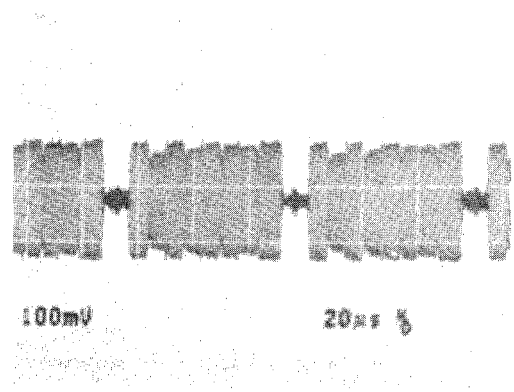
① 13.5 V p-p



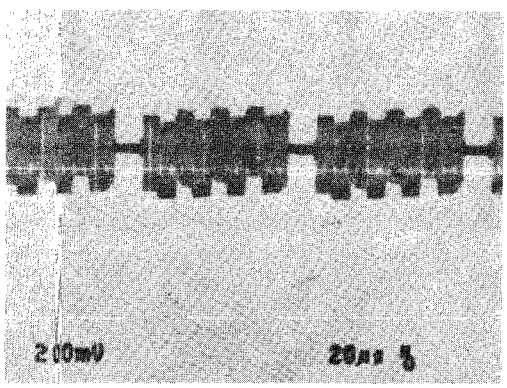
④ 1 V p-p



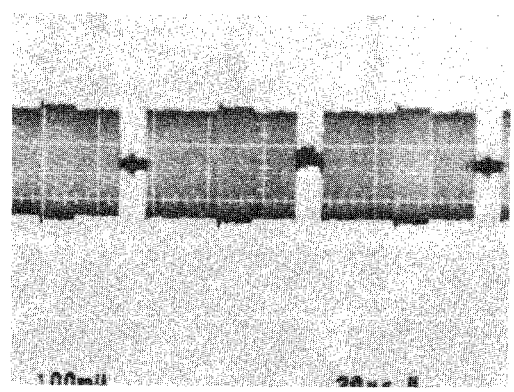
⑥ 2 V p-p



⑦ 2 V p-p

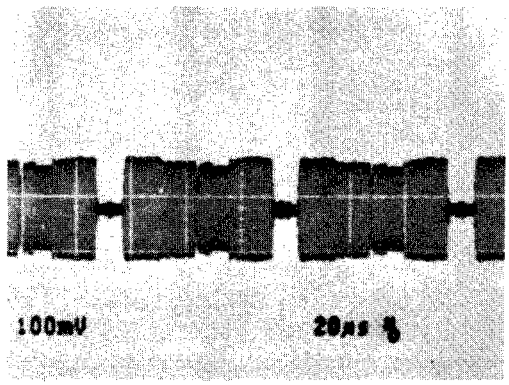


⑧ 3.2V p-p

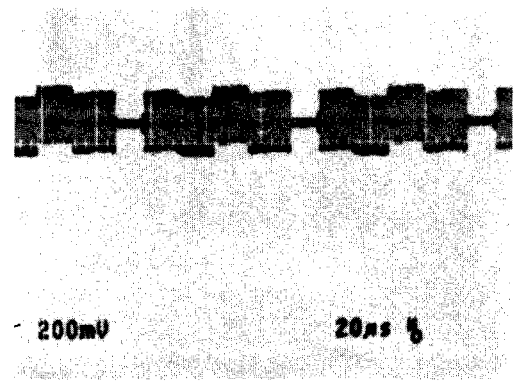


⑩ 2 V p-p

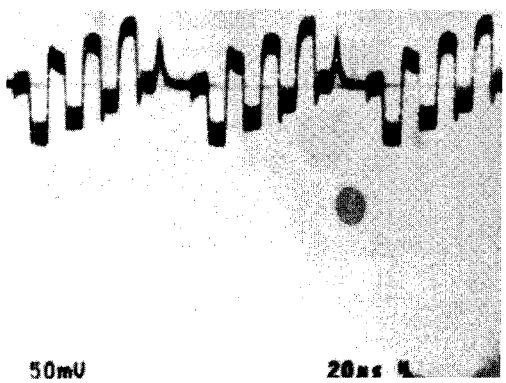
WAVEFORMS(ICN01) WHEN RECEIVING THE SECAM SIGNAL



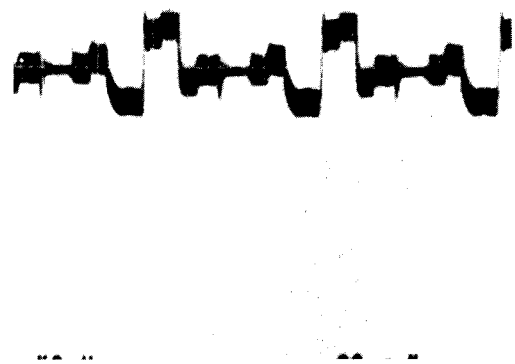
⑪ 1.8 V p-p



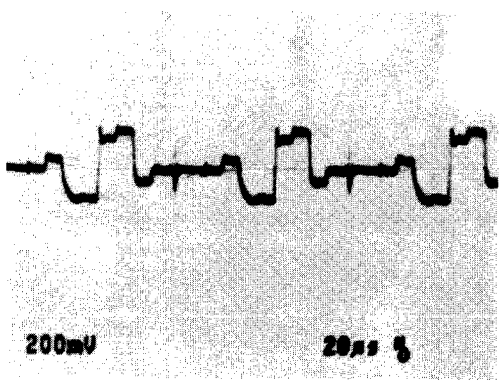
⑫ 2.4 V p-p



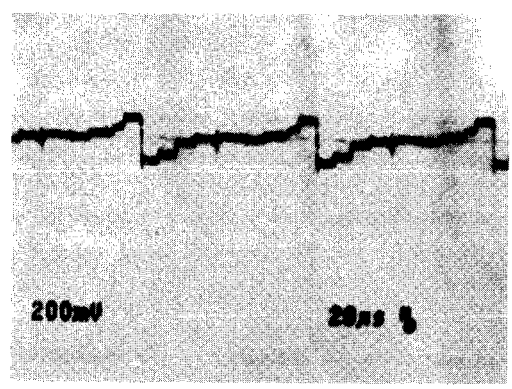
⑭ 1.2 V p-p



⑯ 1 V p-p

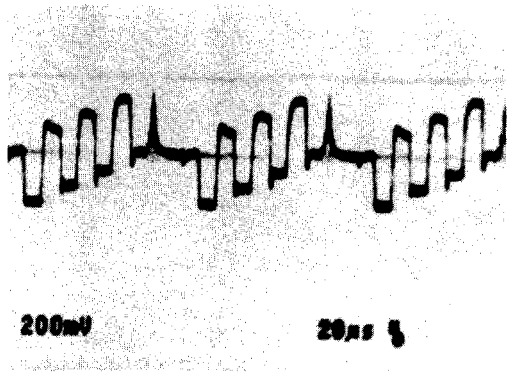
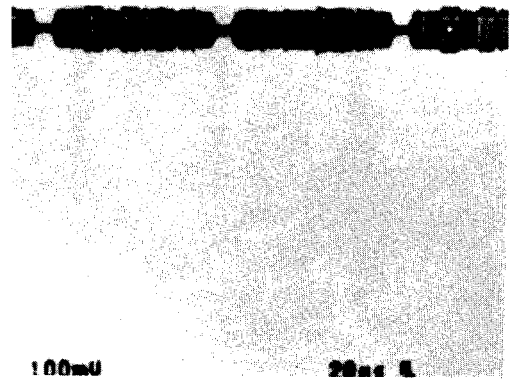
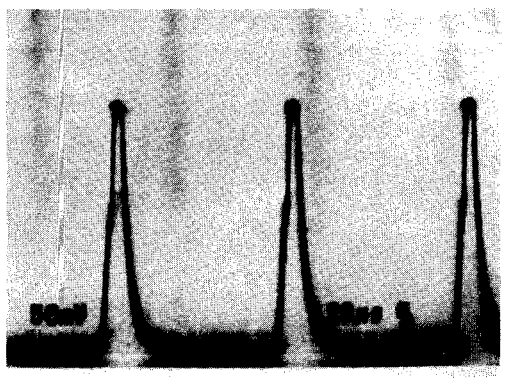


⑱ 2.8 V p-p

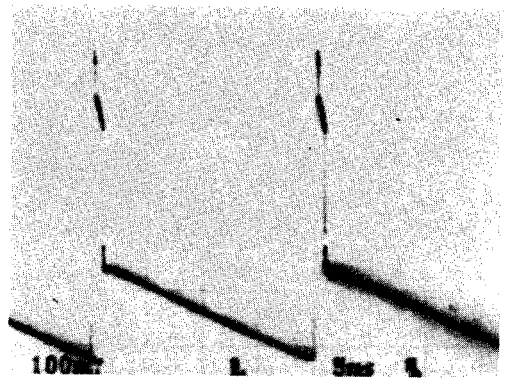


⑳ 2 V p-p

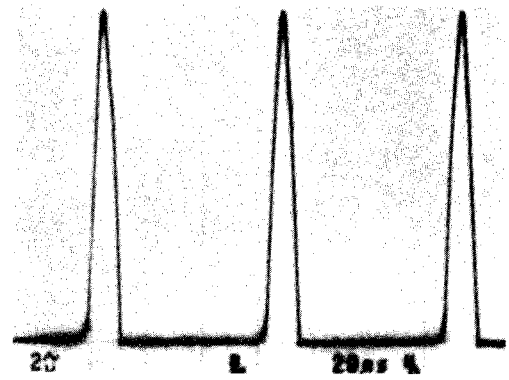
WAVEFORMS(ICN01) WHEN RECEIVING THE SECAM SIGNAL

	
㉒ 4 V p-p	㉗ 700 mV p-p
	
㉚ 2.25 V p-p	

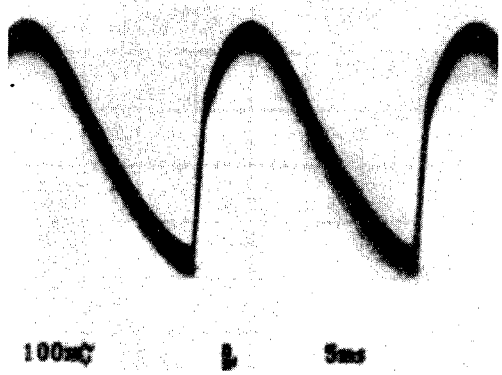
ANOTHER WAVEFORMS



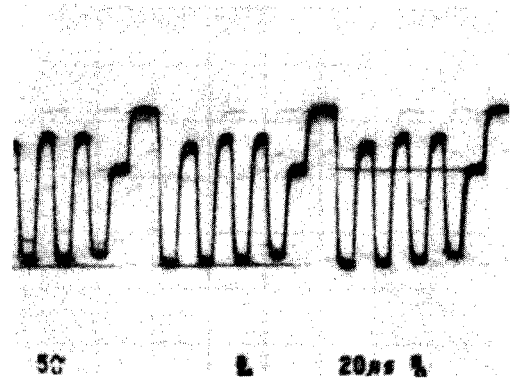
Ⓥ2 55 V p-p



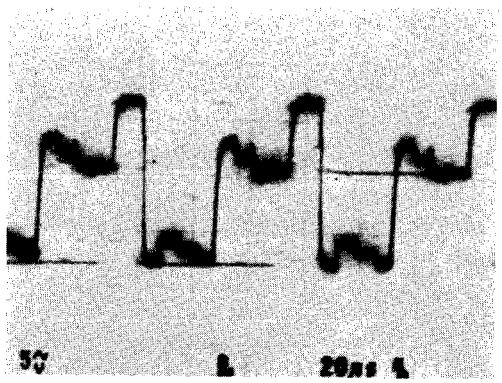
Q 404 COLLECTOR : 1.2 KV p-p



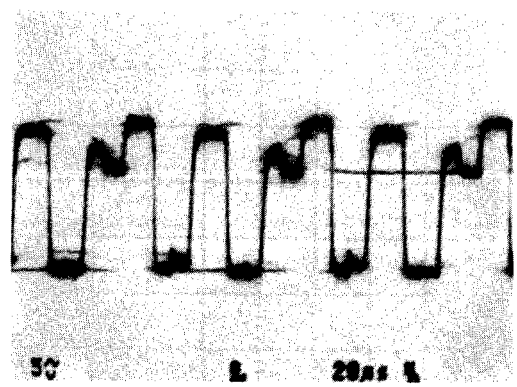
T 402 INPUT : 4.2 V p-p



KB : 140 V p-p



KG : 145 V p-p



KR : 135 p-p

REMOCON FEATURES

1. MICROCOMPUTER (M50431-101SP) FEATURES

- 5V±10% single power supply.
- Auto-search preset function of up to 30 programs (AS (+)/AS(−) keys).
- Sequential program selection by means of local keys and sequentical/direct program selection by means of remote control keys.
- Tuning voltage control $\overline{D/A}$ output adjustable in 16,384 levels.
- Analog outputs of sound volume, contrast, and colour control adjustable in 64 levels.
- Fine frequency (FT(+) and FT(−)) function and its memory function.
- Built-in remote control decoder remote control transmitter IC: M50460-001P.
- Last program memory function.
- Last analog (sound volume, contrast, and colour) memory function.

2. TERMINAL CONNECTION DIAGRAM

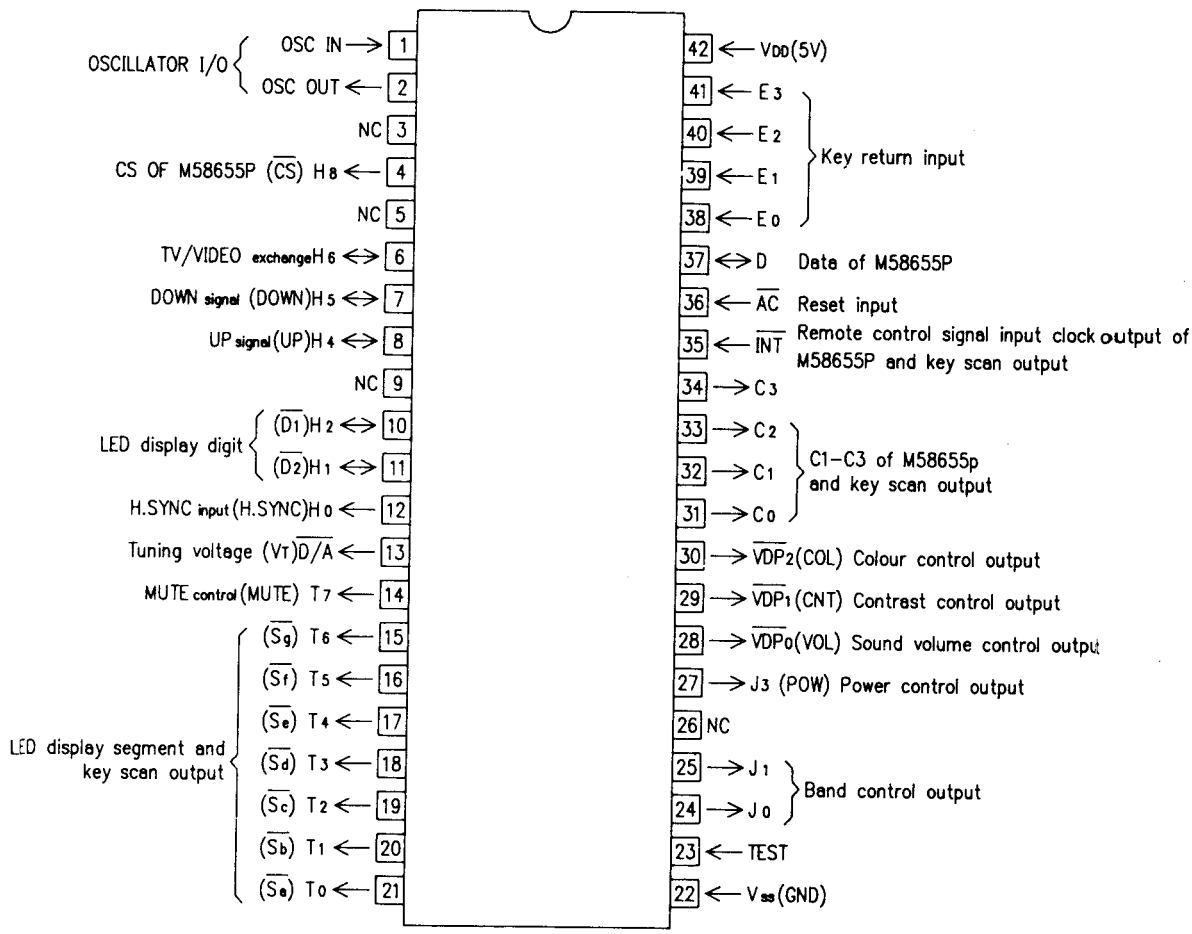

OSCILLATOR I/O
OSC IN → 1
OSC OUT ← 2
NC 3
CS OF M58655P (CS) H8 ← 4
NC 5
TV/VIDEO exchange H6 ⇔ 6
DOWN signal (DOWN) H5 ⇔ 7
UP signal (UP) H4 ⇔ 8
NC 9
LED display digit
(D1) H2 ⇔ 10
(D2) H1 ⇔ 11
H.SYNC input (H.SYNC) H0 ← 12
Tuning voltage (VT) D/A ← 13
MUTE control (MUTE) T7 ← 14
LED display segment and key scan output
(Sg) T6 ← 15
(Sf) T5 ← 16
(Se) T4 ← 17
(Sd) T3 ← 18
(Sc) T2 ← 19
(Sb) T1 ← 20
(Sa) T0 ← 21
42 ← VDD (5V)
41 ← E3
40 ← E2
39 ← E1
38 ← E0
Key return input
37 ⇔ D Data of M58655P
36 ← AC Reset input
35 ← INT Remote control signal input clock output of M58655P and key scan output
34 → C3
33 → C2
32 → C1
31 → C0
C1-C3 of M58655p and key scan output
30 → VDP2 (COL) Colour control output
29 → VDP1 (CNT) Contrast control output
28 → VDP0 (VOL) Sound volume control output
27 → J3 (POW) Power control output
26 NC
25 → J1
24 → J0
Band control output
23 ← TEST
22 ← VSS (GND)

Figure 13. Pin Assignment of M50431-101SP

- $\overline{CS}$ (Chip select output of M59655P)

  This is a chip select signal output terminal for an EAROM M58655P. This signal goes low when data is transferred to the M58655P.

- DOWN (Down signal input)

  This is input of DOWN signal generated by comparing AFC signal with the reference voltage, and use for auto-search and digital AFT operation. Input is in active "H".

- UP (Up signal input)

  This is input UP signal generated by comparing AFC signal with the reference signal, and used for auto-search and digital AFT operation. Input is in active "L".

- H. SYNC (Horizontal synchronous signal input)

  This is an input terminal for horizontal synchronous signal. Pulses entered into H. SYNC terminal are counted for approx. 1.02 ms and when the value of the counter is in the range from 14 to 24, existence of synchronizing signal is determined. The input conditions are as follows:

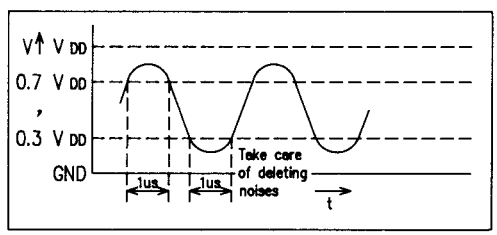


Figure 14. Input Condition of Horizontal Synchronous Signals

keep the settled levels of low and high states for more than 1 us.

In addition, take care of noises around input threshold voltage.

- VT (Tuning volttage control)

  This outputs a waveform which is modulated by the pulse -width in accordance with 14-bit digital information.

- J0 and J1 (Band control output)

  These are control band signal output terminals for a tuner. Assignment for bands is as follows:

TABLE

J0	J1	4 BAND
L	L	BLANK
H	L	VHF-L
H	H	VHF-H
L	H	UHF

- CNT and COL (Contrast control output and colour control output)

  These are contrast and colour control terminals. These output a waveform modulated by the pulse width with 64 levels in accordance with 6-bit latch data. When it is powered on, values before the device is powered off are read out form the EAROM and output to each port.

- $\overline{C3}$ (Clock output for M58655P and key scan output)

  This is a clock output terminal for an EAROM M58655P. Connect this terminal to the CLK of the M58655P and key return signal source output terminals for key matrix.

- $\overline{INT}$ (Remote control signal input)

  This is a remote control signal input terminal. A remote control signal is acknowledged by sensing its edge.

  When a signal applied at the $\overline{INT}$ terminal goes high, the remote control signal reception operation is executed. The remote control signal input decision circuit includes a noise reduction circuit, which serves to delete less than 64 us pulses as noises. It can prevent malfunction of the device due to noises.

- D (Data input/output of M58655P)

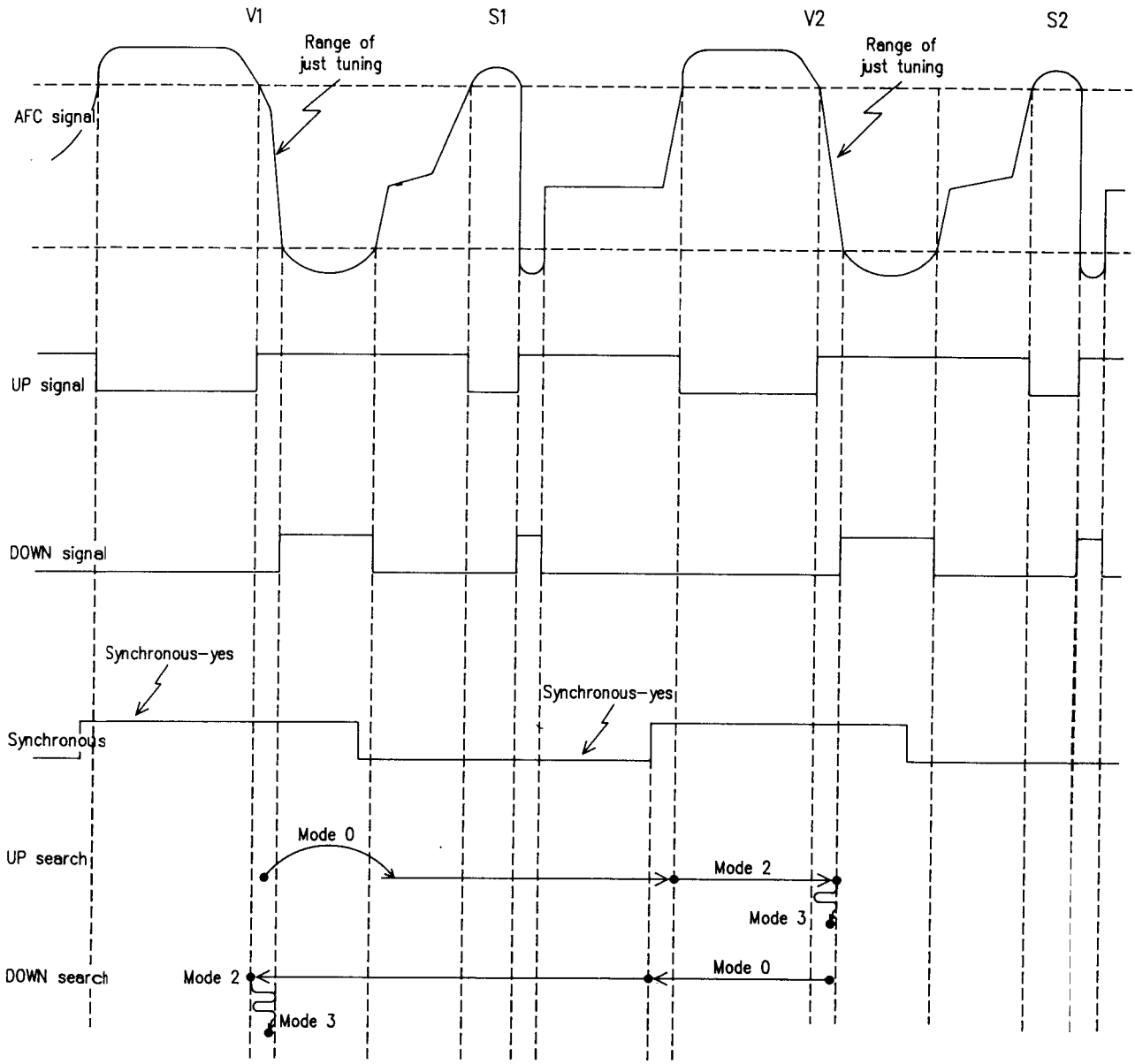
  This is an input/output terminal for EAROM M58655P. Connect this terminal to the I/O of the M58666P.

- VDD (Power supply terminal)

  Connect this terminal to the 5V power supply.

■ AUTOMATIC SEARCH OPERATION

Automatic search operation is executed by checking the synchronous and UP or DOWN signal input given above. The procedure of the automatic search operation is described below. Automatic search consists of 4 modes (mode 0 ~mode 3). Operation in each mode is as follows:



- Mode 0 : Escaping station
- Mode 1 : Detecting synchronous-yes and UP signal-yes
- Mode 2 : Detecting synchronous-yes and DOWN signal-yes
- Mode 3 : Digital AFT.

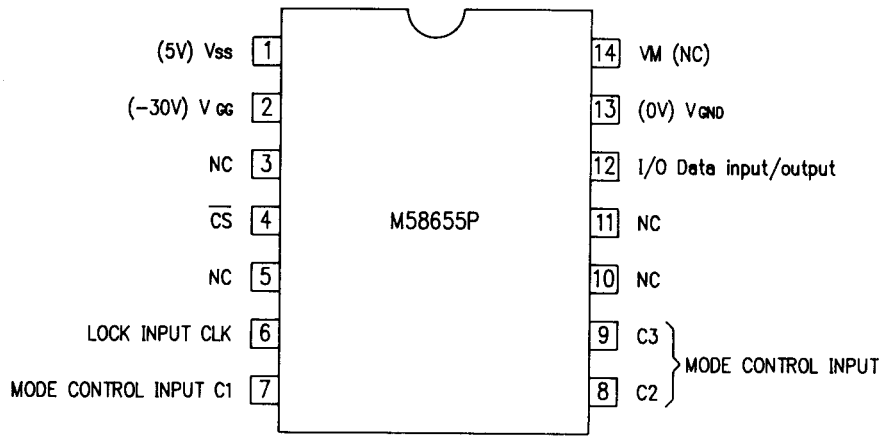
In AFC signal, V : picture signal, S : sound signal

Fig. 15. AFC Signal, Synchronous Signal and Procedure of Search Procedure of Research

3. EAROM (M58655P) FEATURES

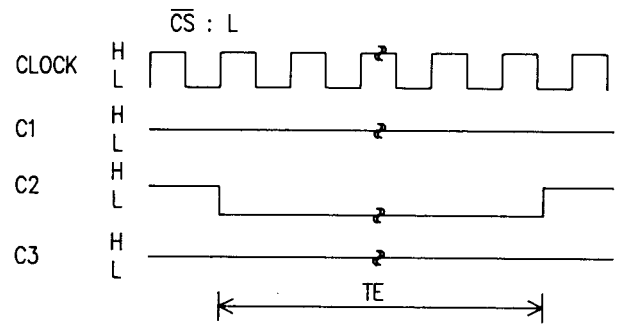
- Word-by-word electrically alterable
- Non-volatile data storage ---------- 10 years (min)
- Write/erase time ---------- 20 ms word
- Typical power supply voltages ---------- 30V, +5V
- Number of erase-write cycles ---------- 10^5 times (min)
- Number of read access unrefreshed ---------- 10^9 times (min)
- 5V I/O interface

- PIN CONFIGURATION (TOP VIEW)

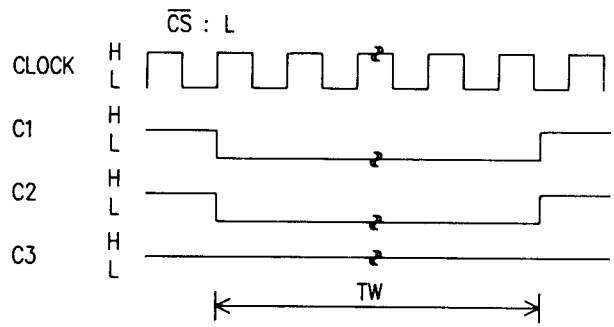


- TIMING DIAGRAM

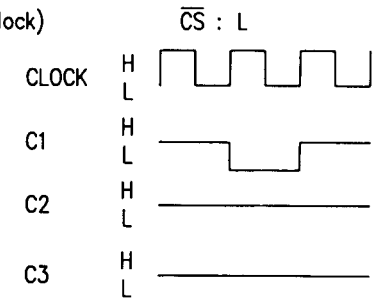
Erase Mode



Write Mode



Read Mode (1 clock)



REMOCON (RM-101) BOARD AND CONTROL BOARD

<table>
<tr><th rowspan="2">SYMPTOM</th><th rowspan="2">CHECK POINT</th><th colspan="2">RESULT</th><th rowspan="2">CAUSE</th></tr>
<tr><th>OK</th><th>NO GOOD</th></tr>
<tr><td>* Power relay does operate</td><td>(1) AC voltage between pins S2 of CNP801.</td><td>AC 13V</td><td>0V</td><td>* Defect in T801, F801, RD01</td></tr>
<tr><td></td><td>(2) Pressing the power button, check the DC voltage of Pin 27 of RIC01</td><td>5V</td><td>0V</td><td>* Defect or poor soldering of RR06, RQ02, Relay switch (RL01), RR01.
* Defect or poor contract of RIC01, CNP801.</td></tr>
<tr><td>* Voltage chart of selector board</td><td>(1) Pin 7 of CNR01.</td><td>125V</td><td>0V</td><td>* Poor contant of CNR01 or defect to +125V line on main board.</td></tr>
<tr><td></td><td>(2) Pin 9 of SNR01.</td><td>12V</td><td>Over 14V or below 10V</td><td>* Defect in Q101, R115, D101 on main board.</td></tr>
<tr><td></td><td>(3) Emitter of RQ01.</td><td>5V</td><td>Below 2V</td><td>* Defect in RQ01, RD06, RR01, RIC01.</td></tr>
<tr><td></td><td>(4) Anode of RD24.</td><td>-30V</td><td>0V</td><td>* Defect in RD02-03, RR01.</td></tr>
<tr><td>* Voltage chart of tuner.</td><td><table><tr><th rowspan="2">VOLTAGE OF TEST POINT</th><th colspan="3">BAND STATE</th></tr><tr><th>VHF LOW</th><th>VHF HIGH</th><th>UHF</th></tr><tr><td>B+</td><td>12V</td><td>12V</td><td>12V</td></tr><tr><td>U</td><td>0V</td><td>0V</td><td>12V</td></tr><tr><td>VH</td><td>0V</td><td>12V</td><td>0V</td></tr><tr><td>VL</td><td>12V</td><td>8.4V</td><td>0V</td></tr></table></td><td colspan="2"></td><td>* Defect in +16.5V line and Q101, D101, R115 of main board or tuner.
* Defect in RIC01, RIC02.</td></tr>
<tr><td>* Channels are not displayed.</td><td>Check CNR03, CNR05, RQ06, RQ07, RIC01.</td><td></td><td></td><td>* Poor contact or defect of CNR03, CNR05 +5V lines.</td></tr>
<tr><td>* Channels up/down of Fine turning up/down, Volume up/down, Analog up/down, etc. doesn't operate.</td><td>Pressing the channel, volume fine up/down button, check RIC01 (The Pin 36-41 of RIC01 are keyboard input and the Pin 17-21 of RIC01 are keyboard output)</td><td>5V</td><td>0V</td><td>* If keyboard input voltage has 5V but it deliver to keyboard output, defect or poor contact of CNR02, CNR04 or select control board.
* If there is no keyboard input voltage, defect of poor contact of RIC01.</td></tr>
<tr><td>* Auto search up/down doesn't operate.</td><td>Pin 1 of CNR02 or Pin 1, 2 of CNR04.</td><td>5V</td><td>0V</td><td>* Defect in RIC01.</td></tr>
<tr><td>* Remote control doesn't operate.</td><td>(1) Depressing the transmitter key, check the collector waveform of QT02 or QT03 on Transmitter PCB.</td><td>40KHz 1Vp-p</td><td>Below 0.5Vp-p</td><td>* Defect in batteries, QT02 coilector voltage is 1Vp-p and the frequency of collector waveform is 40KHz.</td></tr>
<tr><td></td><td>(2) Depressing the transmitter key, check Pin 35 of RIC01.</td><td>4.5Vp-p</td><td>Over 5Vp-p</td><td>* Defect in PA01, RIC01, or the associated parts.</td></tr>
</table>

TDA4601 (IC801)

The integrated circuit TDA4601 or-D is designed for regulating controlling and protecting the switching transistor installed in the flyback converter power supplies. It also protects the complete SMPS by preventing an increase in the secondary voltage in case of errors. In addition to their use with TV receivers and video recorders, these ICs can be applied in power supplies of hi-fi sets and active speakers due to their wide operational ranges and superior voltage stability during high load change.

1. Features
   * Direct control of switching transistor
   * Low start-up current
   * Reversing linear overload characteristic
   * Collector current proportional to base-current input
   * Protective circuit in the event of errors.

2. Pin description

PIN NO	Function
1	Vref output
2	Zero-passage idenfication
3	Input regulating amplfer, overload amplfer
4	Collector-current simulation
5	Possible connection for additional protective circuit
6	Ground (rigidly connected to substrate mounting plate)
7	DC voltage output for charging the coupling capacitor
8	Pulse output, driving the switching transistor
9	Power supply

CHASSIS REPLACEMENT PARTS LIST

ABBREVIATIONS:

CC	C-CERAMIC	RC	R-COMPOSITION
CE	C-ELECTROLYTIC	RD	R-CARBON
CFS	C-M, POLYESTER	RF	R-FUSIBLE
CK	C-CERAMIC, HK	RM	R-METAL, FILM
CQ	C-POLYPROPYLENE, POLYESTER	RP	R-CEMENT WIRE
CS	C-TANTALIUM, SOLID	RS	R-METAL, OXIDE

NOTE: Items marked "*" are not stocked since they are seldom required for routine service. There may be some anticipated delay When you order these items.
*** S.N.A = service not available. ***

Schematic Location	Supplier Part No.	Description
	1. PWB-MAIN	
	1. ASSY-PWB MAIN	
	RESISTORS	
PWBMAN	33004-153-840	330 x 245 x 1.6T (P54S) S.N.A
R100	31018-277-101	RD 1/4T 100-J
ER101	31018-277-101	RD 1/4T 100-J
R106	31018-277-102	RD 1/4T 1K-J
R161	31018-277-102	RD 1/4T 1K-J
R215	31018-277-102	RD 1/4T 1K-J
R226	31018-277-102	RD 1/4T 1K-J
R311	31018-277-102	RD 1/4T 1K-J
R324	31018-277-102	RD 1/4T 1K-J
R602	31018-277-102	RD 1/4T 1K-J
R604	31018-277-102	RD 1/4T 1K-J
R608	31018-277-102	RD 1/4T 1K-J
R810	31018-277-103	RD 1/4T 10K-J
RR05	31018-277-103	RD 1/4T 10K-J
RR12	31018-277-103	RD 1/4T 10K-J
RR32	31018-277-103	RD 1/4T 10K-J
RR34	31018-277-103	RD 1/4T 10K-J
RR37	31018-277-103	RD 1/4T 10K-J
RR38	31018-277-103	RD 1/4T 10K-J
RR45	31018-277-103	RD 1/4T 10K-J
RR60	31018-277-103	RD 1/4T 10K-J
RR61	31018-277-103	RD 1/4T 10K-J
RR63	31018-277-103	RD 1/4T 10K-J
RS05	31018-277-103	RD 1/4T 10K-J
RN30	31018-277-103	RD 1/4T 10K-J
ER105	31018-277-103	RD 1/4T 10K-J
R403	31018-277-104	RD 1/4T 100K-J
R429	31018-377-104	RD 1/2T 100K-J
R531	31018-277-104	RD 1/4T 100K-J
R609	31018-277-104	RD 1/4T 100K-J
R615	31018-277-104	RD 1/4T 100K-J
RR23	31018-277-104	RD 1/4T 100K-J
RR68	31018-277-104	RD 1/4T 100K-J
R513	31018-277-121	RD 1/4T 120-J
R518	31018-277-121	RD 1/4T 120-J
R525	31018-277-122	RD 1/4T 1.2K-J
R220	31018-277-122	RD 1/4T 1.2K-J
R809	31018-277-122	RD 1/4T 1.2K-J
RN10	31018-277-122	RD 1/4T 1.2K-J
RN14	31018-277-122	RD 1/4T 1.2K-J
R519	31018-277-123	RD 1/4T 12K-J
R210	31018-277-123	RD 1/4T 12K-J
R614	31018-277-124	RD 1/4T 120K-J
R503	31018-277-132	RD 1/4T 1.3K-J
R303	31018-277-133	RD 1/4T 13K-J
RR13	31018-277-151	RD 1/4T 150-J
RR14	31018-277-151	RD 1/4T 150-J
RR15	31018-277-151	RD 1/4T 150-J
RR16	31018-277-151	RD 1/4T 150-J
RR17	31018-277-151	RD 1/4T 150-J
RR18	31018-277-151	RD 1/4T 150-J
RR19	31018-277-151	RD 1/4T 150-J
RN21	31018-277-151	RD 1/4T 150-J
RN23	31018-277-151	RD 1/4T 150-J
R103	31018-277-152	RD 1/4T 1.5K-J
R108	31018-277-152	RD 1/4T 1.5K-J
RN09	31018-277-152	RD 1/4T 1.5K-J
RN13	31018-277-152	RD 1/4T 1.5K-J
R405	31018-277-153	RD 1/4T 15K-J
RN05	31018-277-153	RD 1/4T 15K-J
RR73	31018-277-153	RD 1/4T 15K-J
R808	31018-277-153	RD 1/4T 15K-J
RR74	31018-277-154	RD 1/4T 150K-J
RN02	31018-277-154	RD 1/4T 150K-J
RR71	31018-277-154	RD 1/4T 150K-J
R206	31018-277-162	RD 1/4T 1.6K-J
R211	31018-277-162	RD 1/4T 1.6K-J
RN33	31018-277-181	RD 1/4T 180-J
R101	31018-277-182	RD 1/4T 1.8K-J
RN27	31018-277-182	RD 1/4T 1.8K-J
R619	31018-277-183	RD 1/4T 18K-J

Schematic Location	Supplier Part No.	Description	Schematic Location	Supplier Part No.	Description
R528	31018-277-201	RD 1/4T 200-J	RN03	31018-277-334	RD 1/4T 330K-J
RR65	31018-277-202	RD 1/4T 2K-J	R606	31018-277-361	RD 1/4T 360-J
RR24	31018-277-220	RD 1/4T 22-J	R404	31018-277-362	RD 1/4T 3.6K-J
R409	31018-277-221	RD 1/4T 220-J	R410	31018-277-362	RD 1/4T 3.6K-J
R811	31018-277-221	RD 1/4T 220-J	R535	31018-277-362	RD 1/4T 3.6K-J
RN01	31018-277-221	RD 1/4T 220-J	R539	31018-277-362	RD 1/4T 3.6K-J
R517	31018-277-221	RD 1/4T 220-J	R537	31018-277-362	RD 1/4T 3.6K-J
R304	31018-277-222	RD 1/4T 2.2K-J	R307	31018-277-362	RD 1/4T 3.6K-J
R536	31018-277-222	RD 1/4T 2.2K-J	R224	31018-277-363	RD 1/4T 36K-J
R538	31018-277-222	RD 1/4T 2.2K-J	R163	31018-277-391	RD 1/4T 390-J
R540	31018-277-222	RD 1/4T 2.2K-J	RN18	31018-277-391	RD 1/4T 390-J
R102	31018-277-223	RD 1/4T 22K-J	RN20	31018-277-391	RD 1/4T 390-J
R314	31018-277-223	RD 1/4T 22K-J	R213	31018-277-392	RD 1/4T 3.9K-J
R416	31018-277-223	RD 1/4T 22K-J	R421	31018-277-392	RD 1/4T 3.9K-J
RS01	31018-277-223	RD 1/4T 22K-J	R104	31018-277-392	RD 1/4T 3.9K-J
R201	31018-277-242	RD 1/4T 2.4K-J	R305	31018-277-393	RD 1/4T 39K-J
R205	31018-277-242	RD 1/4T 2.4K-J	RN06	31018-277-393	RD 1/4T 39K-J
R302	31018-277-224	RD 1/4T 240K-J	R313	31018-277-393	RD 1/4T 39K-J
R306	31018-277-224	RD 1/4T 240K-J	RR28	31018-277-432	RD 1/4T 4.3K-J
R164	31018-277-270	RD 1/4T 27-J	RR30	31018-277-432	RD 1/4T 4.3K-J
RN25	31018-277-270	RD 1/4T 27-J	R105	31018-277-433	RD 1/4T 43K-J
R426	31018-277-271	RD 1/4T 270-J	RR72	31018-277-433	RD 1/4T 43K-J
R508	31018-277-272	RD 1/4T 2.7K-J	R505	31018-277-471	RD 1/4T 470-J
R509	31018-277-272	RD 1/4T 2.7K-J	R222	31018-277-471	RD 1/4T 470-J
R512	31018-277-272	RD 1/4T 2.7K-J	RR49	31018-277-471	RD 1/4T 470-J
RN04	31018-277-272	RD 1/4T 2.7K-J	R109	31018-277-472	RD 1/4T 4.7K-J
ER102	31018-277-272	RD 1/4T 2.7K-J	R319	31018-277-472	RD 1/4T 4.7K-J
R214	31018-277-272	RD 1/4T 2.7K-J	RR40	31018-277-472	RD 1/4T 4.7K-J
ER107	31018-277-272	RD 1/4T 2.7K-J	R618	31018-277-472	RD 1/4T 4.7K-J
ER103	31018-277-273	RD 1/4T 27K-J	RR06	31081-277-472	RD 1/4T 4.7K-J
RR29	31018-277-303	RD 1/4T 30K-J	RR41	31018-277-472	RD 1/4T 4.7K-J
ER31	31018-277-303	RD 1/4T 30K-J	RR42	31018-277-472	RD 1/4T 4.7K-J
RR33	31018-277-303	RD 1/4T 30K-J	R610	31018-277-472	RD 1/4T 4.7K-J
RR35	31018-277-303	RD 1/4T 30K-J	R312	31018-277-473	RD 1/4T 47K-J
ER106	31018-277-303	RD 1/4T 30K-J	R533	31018-277-475	RD 1/4T 4.7M-J
R165	31018-277-331	RD 1/4T 330-J	R529	31018-277-511	RD 1/4T 510-J
R202	31018-277-331	RD 1/4T 330-J	R617	31018-277-512	RD 1/4T 5.1K-J
R317	31018-277-331	RD 1/4T 330-J	RR70	31018-277-513	RD 1/4T 51K-J
R607	31018-277-331	RD 1/4T 330-J	R107	31018-277-513	RD 1/4T 51K-J
R415	31018-277-332	RD 1/4T 3.3K-J	R603	31018-277-560	RD 1/4T 56-J
RR27	31018-277-332	RD 1/4T 3.3K-J	R203	31018-277-820	RD 1/4T 82-J
RN11	31018-277-332	RD 1/4T 3.3K-J	R110	31018-277-562	RD 1/4T 5.6K-J
RN15	31018-277-332	RD 1/4T 3.3K-J	R162	31018-277-562	RD 1/4T 5.6K-J
RN22	31018-277-332	RD 1/4T 3.3K-J	ER104	31018-277-562	RD 1/4T 5.6K-J
RN24	31018-277-332	RD 1/4T 3.3K-J	R611	31018-277-562	RD 1/4T 5.6K-J
RN26	31018-277-332	RD 1/4T 3.3K-J	R227	31018-277-563	RD 1/4T 56K-J
RN28	31018-277-332	RD 1/4T 3.3K-J	RR76	31018-277-563	RD 1/4T 56K-J
R318	31018-277-333	RD 1/4T 33K-J	RN08	31018-277-564	RD 1/4T 560K-J
RR39	31018-277-333	RD 1/4T 33K-J	R218	31018-277-564	RD 1/4T 560K-J
RN504	31018-277-333	RD 1/4T 33K-J	R412	31018-277-620	RD 1/4T 62-J
R111	31018-277-333	RD 1/4T 33K-J	R308	31018-277-622	RD 1/4T 6.2K-J
R501	31018-277-334	RD 1/4T 330K-J	R223	31018-277-680	RD 1/4T 68-J

Schematic Location	Supplier Part No.	Description
RN12	31018-277-681	RD 1/4T 680-J
RN16	31018-277-681	RD 1/4T 680-J
RN17	31018-277-681	RD 1/4T 680-J
RR43	31018-277-682	RD 1/4T 6.8K-J
RS03	31018-277-683	RD 1/4T 68K-J
RN07	31018-277-683	RD 1/4T 68K-J
RS04	31018-277-683	RD 1/4T 68K-J
R616	31018-277-683	RD 1/4T 68K-J
RR46	31018-277-683	RD 1/4T 68K-J
R225	31018-277-684	RD 1/4T 680K-J
R620	31018-277-751	RD 1/4T 750-J
R812	31018-277-752	RD 1/4T 7.5K-J
R530	31018-277-821	RD 1/4T 820-J
RN19	31018-277-821	RD 1/4T 820-J
ER109	31018-277-821	RD 1/4T 820-J
R532	31018-277-823	RD 1/4T 82K-J
RR69	31018-277-823	RD 1/4T 82K-J
RR72	31018-277-823	RD 1/4T 82K-J
RS02	31018-277-823	RD 1/4T 82K-J
ER108	31018-277-823	RD 1/4T 82K-J
R219	31018-277-824	RD 1/4T 820K-J
R612	31018-277-912	RD 1/4T 9.1K-J
R207	31018-376-124	RD 1/2T 120K-G
R316	31018-377-102	RD 1/2T 1K-J
R424	31018-377-102	RD 1/2T 1K-J
RR75	31018-377-103	RD 1/2T 10K-J
R803	31018-377-270	RD 1/2T 27-J
R406	31018-377-272	RD 1/2T 2.7K-J
R310	31018-377-279	RD 1/2T 2.7-J
R407	31018-377-391	RD 1/2T 390-J
R221	31018-377-471	RD 1/2T 470-J
R411	31018-377-680	RD 1/2T 68-J
R822	31018-377-680	RD 1/2T 68-J
R522	31028-328-472	RC 1/2T 4.7K-K
R523	31028-328-472	RC 1/2P 4.7K-K
R524	31018-328-472	RC 1/2P 4.7K-K
R815	31028-328-475	RC 1/2P 4.7M-K
R804	31039-586-390	RW 5J 39-J
R801	31039-687-569	RW 7H 5.6-J
R413	31046-477-102	RS 1T 1K-J
R514	31046-477-153	RS 1T 15K-J
R807	31046-477-274	RS 1T 270K-J
R806	31046-477-274	RS 1T 270K-J
R428	31046-477-391	RS 1T 390-J
R805	31046-577-101	RS 2T 100-J
R813	31046-577-154	RS 2T 150K-J
R821	31046-577-333	RS 2T 33K-J
R526	31047-252-942	RM 1/4T 29.4K-F
R521	31047-258-252	RM 1/4T 82.5K-F
R820	31049-101-260	RS 1P 68-J
R315	31046-477-331	RS 1T 330-J
R516	31046-477-153	RS 1T 15K-J

Schematic Location	Supplier Part No.	Description
R515	31046-477-153	RS 1T 15K-J
R527	31049-275-283	RM 1/4T 28K-F
R309	31049-276-433	RM 1/4T 43K-G
R425	31049-276-433	RM 1/4T 43K-G
R819	31049-313-260	RS 1P 1.2K-J
R818	31049-315-310	RS 2P 12K-J
R814	31049-317-104	RS 3P 2.7K-J
R208	31049-375-913	RM 1/2T 91K-F
R802	31049-903-020	RS 2N 0.68-J
R414	31049-974-200	RM 1/4T 15K-G
R461	31058-327-150	RS 1/2P 150-J
R408	31059-002-010	RF 1/2P 1-J
R420	31059-002-010	RF 1/2P 1-J
R427	31059-002-052	RF 1/2P 1K-J
R816	31059-002-130	RF 1/2P 0.47-K
R817	31059-002-130	RF 1/2P 0.47-K
R504	31059-002-130	RF 1/2P 0.47-K
VR505	31249-125-009	CET-115A B200
VR506	31249-125-009	CET-115A B200
VR502	31249-125-015	CET 115A B5K
VR503	31249-125-015	CET 115A B5K
VR504	31249-125-015	CET 115A B5K
VR151	31249-128-001	EVN-DXA AOO B10K
VR401	31249-128-001	EVN-DXA AOO B10K
VR801	31249-128-001	EVN-DXA AOO B10K
VR302	31249-128-001	EVN-DXA AOO B10K
VR203	31249-128-003	EVN-DXA B2K
VRN507	31249-128-004	EVN-DXA AOO B1K
CN07	31407-048-560	CC45 RH 50V 560-K
C201	31407-101-440	CC45 SL 50V 221-J
C504	31407-105-150	CC45 CH 50V 160-J
C509	31407-105-180	CC45 CH 50V 220-J
C604	31407-105-180	CC45 CH 50V 220-J
C521	31407-105-180	CC45 CH 50V 220-J
RC12	31407-105-270	CC45 CH 50V 300-J
RC13	31407-105-270	CC45 CH 50V 300-J
C520	31407-105-300	CC45 CH 50V 680-J
C607	31407-105-300	CC45 CH 50V 680-J
CN26	31407-105-320	CC45 CH 50V 820-J
C816	31407-105-660	CC45 CH 50V 101-J
C512	31407-105-700	CC45 CH 50V 151-J
C108	31407-106-120	CC45 RH 50V 120-J
C202	31407-106-150	CC45 RH 50V 150-J
C204	31407-106-150	CC45 RH 50V 150-J
CN01	31407-106-230	CC45 RH 50V 300-J
C518	31407-106-380	CC45 RH 50V 181-J
CN30	31407-106-380	CC45 RH 50V 181-J
CN10	31407-107-070	CC45 UJ 50V 470-J
CN11	31407-107-070	CC45 UJ 50V 470-J
C109	31417-104-070	CK45 B 50V 271-K
C515	31417-104-070	CK45 B 50V 271-K
C160	31407-057-330	CK45 B 50V 330-J

Schematic Location	Supplier Part No.	Description	Schematic Location	Supplier Part No.	Description
C205	31417-104-250	CK45 B 50V 471-K	C413	31419-901-180	CK45 B 2KV 271-K
C514	31417-104-250	CK45 B 50V 471-K	C806	31469-502-220	AC 250V 0.0022M-Z
C511	31417-104-250	CK45 B 50V 471-K	C817	31469-504-060	ECK-DNS472MEX
C516	31417-104-250	CK45 B 50V 471-K	C818	31469-504-060	ECK-DNS472MEX
C406	31417-104-270	CK45 B 50V 681-K	RC07	31507-121-010	CQ921M 100V 0.001M-J
RC19	31417-104-330	CK45 B 50V 331-K	C409	31507-121-030	CQ921M 100V 0.0015J
C101	31417-104-400	CK45 B 50V 102-K	C309	31507-121-030	CQ921M 100V 0.0015J
CN09	31417-104-400	CK45 B 50V 102-K	C404	31507-121-110	CQ921M 100V 0.0056M-J
CN17	31417-104-400	CK45 B 50V 102-K	C405	31507-121-110	CQ921M 100V 0.0056M-J
C305	31417-104-560	CK45 B 50V 561-K	C304	31507-121-140	CQ921M 100V 0.01M-J
CN08	31417-104-560	CK45 B 50V 561-K	C206	31507-121-140	CQ921M 100V 0.01M-J
C513	31417-104-560	CK45 B 50V 561-K	C408	31507-121-140	CQ921M 100V 0.01M-J
CN16	31417-106-020	CK45 B 500V 221-K	C103	31507-121-150	CQ921M 100V 0.015M-J
CN21	31417-106-020	CK45 B 500V 221-K	C303	31507-121-150	CQ921M 100V 0.015M-J
CN18	31417-106-020	CK45 B 500V 221-K	C526	31507-121-180	CQ921M 100V 0.22M-J
C306	31417-104-400	CK45 B 50V 102-K	C527	31507-121-180	CQ921M 100V 0.22M-J
C100	31417-109-140	CK45 F 50V 103-Z	C307	31507-121-200	CQ921M 100V 0.33M-J
C102	31417-109-140	CK45 F 50V 103-Z	C310	31507-121-220	CQ921M 100V 0.047M-J
C161	31417-109-140	CK45 F 50V 103-Z	C104	31507-121-570	CQ921M 100V 0.068-K
C162	31417-109-140	CK45 F 50V 103-Z	C605	31507-121-570	CQ921M 100V 0.068-K
C163	31417-109-140	CK45 F 50V 103-Z	C308	31507-121-910	CQ921M 100V 0.051-K
C602	31417-109-140	CK45 F 50V 103-Z	C203	31507-121-920	CQ921M 100V 0.1μ-M
C603	31417-109-140	CK45 F 50V 103-Z	C311	31507-121-920	CQ921M 100V 0.1μ-M
C608	31417-109-140	CK45 F 50V 103-Z	RC01	31507-121-920	CQ921M 100V 0.1μ-M
C402	31417-109-140	CK45 F 50V 103-Z	CN12	31507-121-920	CQ921M 100V 0.1μ-M
C502	31417-109-140	CK45 F 50V 103-Z	CN28	31507-121-920	CQ921M 100V 0.1μ-M
C503	31417-109-140	CK45 F 50V 103-Z	C403	31507-122-030	CQ921M 50V 0.0036M-J
C523	31417-109-140	CK45 F 50V 103-Z	RC09	31509-123-270	CQ921M 100V 0.33MF (S)
C524	31417-109-140	CK45 F 50V 103-Z	RC10	31509-123-270	CQ921M 100V 0.33MF (S)
C525	31417-109-140	CK45 F 50V 103-Z	C810	31509-337-770	CQ922M 400V 0.0082-J
C529	31417-109-140	CK45 F 50V 103-Z	C809	31509-337-770	CQ922M 400V 0.0082-J
RC05	31417-109-140	CK45 F 50V 103-Z	C412	31509-391-010	CQ922M 1600V 0.003-J
RC16	31417-109-140	CK45 F 50V 103-Z	C814	31509-391-090	CQ922M 1600V 0.0022-J
RC18	31417-109-140	CK45 F 50V 103-Z	C411	31509-391-110	CQ922M 1600V 0.0047-J
RC26	31417-109-140	CK45 F 50V 103-Z	C801	31569-204-190	ECQ-EW 250V 0.47M
CN02	31417-109-140	CK45 F 50V 103-Z	C802	31569-204-190	ECQ-EW 250V 0.47M
CN03	31417-109-140	CK45 F 50V 103-Z	C415	31509-003-020	CFS922M 400V 0.1-K
CN04	31417-109-140	CK45 F 50V 103-Z	C830	31509-003-020	CFS922M 400V 0.1-K
CN25	31417-109-140	CK45 F 50V 103-Z	C414	31509-335-190	CQ922M 200V 0.43N-J
CN29	31417-109-140	CK45 F 50V 103-Z	C252	31607-401-430	CE04W 25V 10M
EC105	31417-109-140	CK45 F 50V 103-Z	C253	31607-401-430	CE04W 25V 10M
C111	31417-109-140	CK45 F 50V 103-Z	C453	31607-401-430	CE04W 25V 10M
C410	31417-318-222	CK45 B 50V 222-K	CS01	31607-401-430	CE04W 25V 10M
C832	31419-901-680	CK45 B 1KV 152-K	CS02	31607-401-430	CE04W 25V 10M
C821	31417-901-320	CK45 B 1KV 331-K	CN14	31607-401-430	CE04W 25V 10M
C822	31417-901-320	CK45 B 1KV 331-K	CN15	31607-401-430	CE04W 25V 10M
C828	31417-901-320	CK45 B 1KV 331-K	C153	31607-401-430	CE04W 25V 10M
C815	31418-618-851	CK45 B 1KV 851-K	CN20	31607-401-430	CE04W 25V 10M
C519	31418-767-331	CK45 B 2KV 331-K	C154	31607-401-460	CE04W 16V 47M
C803	31469-502-220	AC 250V 0.0022M-Z	C152	31607-401-470	CE04W 16V 100M
C804	31469-502-220	AC 250V 0.0022M-Z	C660	31607-401-670	CE04W 25V 47M
C805	31469-502-220	AC 250V 0.0022M-Z	C811	31607-401-680	CE04W 25V 100μ

Schematic Location	Supplier Part No.	Description	Schematic Location	Supplier Part No.	Description
C600	31607-401-680	CE04W 25V 100M	C356	31609-401-180	CE04W 16V 1000μ
C813	31607-401-680	CE04W 25V 100μ	CN13	31609-401-180	CE04W 16V 1000μ
C808	31607-401-680	CE04W 25V 100μ	EC104	31609-401-500	CE04W 16V 470M
RC23	31607-402-060	CE04W 35V 10μ	C650	31609-401-710	CE04W 25V 470m
RC15	31607-402-060	CE04W 35V 10μ	C658	31609-401-740	CE04W 25V 2200M
C654	31607-402-060	CE04W 35V 10μ	C257	31609-401-740	CE04W 25V 2200M
C157	31607-402-060	CE04W 35V 10μ	C357	31609-402-100	CE04W 35V 100M
C659	31607-402-060	CE04W 35V 10μ	C823	31609-402-110	CE04W 35V 220M
CN19	31607-402-060	CE04W 35V 10μ	C824	31609-402-110	CE04W 35V 220M
C151	31607-402-200	CE04W 50V 0.47M	C456	31609-402-130	CE04W 35V 470M
C351	31607-402-200	CE04W 50V 0.47M	C457	31609-402-130	CE04W 35V 470M
C452	31607-402-200	CE04W 50V 0.47M	C819	31609-402-130	CE04W 35V 470M
C553	31607-402-200	CE04W 50V 0.47M	C831	31609-402-290	CE04W 50V 100M
C555	31607-402-200	CE04W 50V 0.47M	C829	31609-403-210	CE04W 160V 10M
CN27	31607-402-200	CE04W 50V 0.47M	C826	31609-403-250	CE04W 160V 100M
C156	31607-402-210	CE04W 50V 1M	C827	31609-403-250	CE04W 160V 100M
C251	31607-402-210	CE04W 50V 1M	C459	31609-403-960	CE04W 100V 22μF
C254	31607-402-210	CE04W 50V 1M	C807	31609-964-151	CE04W 400V 150μ
C358	31607-402-210	CE04W 50V 1M	C353	31627-201-340	CS 35V 2.2M-K
C451	31607-402-210	CE04W 50V 1M	C354	31627-201-340	CS 35V 2.2M-K
C455	31607-402-210	CE04W 50V 1M	C352	31627-201-370	CS 35V 0.22M-K
C511	31607-402-210	CE04W 50V 1M	C506	31829-105-610	TZ03P 450E
C651	31607-402-210	CE04W 50V 1M	RIC01	32109-101-160	M50431-101SP
C812	31607-402-210	CE04W 50V 1M	RIC02	32109-201-190	M58655P
RC11	31607-402-210	CE04W 50V 1M	IC501	32109-303-040	SS/TA 7698P/AP
CN22	31607-402-210	CE04W 50V 1M	EIC01	32119-101-010	TEA2014
CN23	31607-402-210	CE04W 50V 1M	ICN01	32119-101-020	M5139AP
CN24	31607-402-210	CE04W 50V 1M	RD16	32119-101-360	KA33V
CN05	31607-402-210	CE04W 50V 1M	IC101	32119-102-050	LA7520
CN31	31607-402-210	CE04W 50V 1M	RIC03	32119-201-120	LM393
C158	31607-402-220	CE04W 50V 2.2M	RIC04	32119-201-270	LA7910
C652	31607-402-220	CE04W 50V 2.2M	Q802	32119-401-110	MC7805C
C155	31607-402-240	CE04W 50V 4.7M	Q201	32137-103-430	KSA 642-O
C554	31607-402-240	CE04W 50V 4.7M	Q403	32137-301-510	KSC 2310-O
C657	31607-402-240	CE04W 50V 4.7M	Q501	32137-301-530	KSC 2330-O
RC14	31607-402-240	CE04W 50V 4.7M	Q502	32137-301-530	KSC 2330-O
C359	31607-402-250	CE04W 50V 10M	Q503	32137-301-530	KSC 2330-O
RC17	31607-402-250	CE04W 50V 10M	Q402	32137-301-550	KSC 2331-O
C355	31607-402-280	CE04W 50V 47μ	Q404	32149-401-050	2SD 1651
C825	31607-402-280	CE04W 50V 47μ	RQ01	32137-301-560	KSC 2331-Y
C833	31607-402-280	CE04W 50V 47μ	RQ02	32137-301-720	KSC 815-Y
EC101	31607-402-530	CE04W 50V 0.47μ	RQ03	32137-301-720	KSC 815-Y
EC102	31607-402-530	CE04W 50V 0.47μ	EQ101	32137-301-720	KSC 815-Y
EC103	31607-402-530	CE04W 50V 0.47μ	EQ102	32137-301-720	KSC 815-Y
C834	31607-403-060	CE04W 100V 10μ	EQ103	32137-301-720	KSC 815-Y
RC06	31607-403-170	CE04W 160V 1M	QS01	32137-301-720	KSC 815-Y
C461	31607-403-450	CE04W 250V 1M	QS02	32137-301-720	KSC 815-Y
C159	31607-902-250	CE04W 50V 0.22M	QS03	32137-301-720	KSC 815-Y
C653	31607-902-250	CE04W 50V 0.22M	RQ04	32137-401-530	KSC 539-Y
CS03	31607-902-250	CE04W 50V 0.22M	RQ05	32137-401-530	KSC 539-Y
C820	31609-401-140	CE04W 6.3V 1000M	Q161	32139-301-090	2SC 388-A
C256	31609-401-180	CE04W 16V 1000μ	D205	32167-201-070	1N4003 TAPG

Schematic Location	Supplier Part No.	Description
D405	32167-201-070	1N4003 TAPG
D815	32167-201-070	1N4003 TAPG
D404	32167-208-510	ERB 43-04 TAPG
D816	32167-208-510	ERB 43-04 TAPG
D817	32167-208-510	ERB 43-04 TAPG
D811	32167-208-510	ERB 43-04 TAPG
D407	32167-208-510	ERB 43-04 TAPG
D408	32167-208-510	ERB 43-04 TAPG
D812	32167-208-550	ERC 24-06 TAPG
D814	32167-208-550	ERC 24-06 TAPG
D807	32167-208-550	ERC 24-06 TAPG
D809	32167-208-550	ERC 24-06 TAPG
D805	32167-208-550	ERC 24-06 TAPG
D808	32167-208-550	ERC 24-06 TAPG
D301	32167-208-570	ERB 29-04
D801	32167-208-580	ERB 12-06
D802	32167-208-580	ERB 12-06
D803	32167-208-580	ERB 12-06
D804	32167-208-580	ERB 12-06
D810	32167-401-330	EQA 02-30B
RD15	32167-406-040	MTZ 3.6A
D201	32167-406-480	1N4148 TAPG
D206	32167-406-480	1N4148 TAPG
D302	32167-406-480	1N4148 TAPG
D403	32167-406-480	1N4148 TAPG
D411	32167-406-480	1N4148 TAPG
D412	32167-406-480	1N4148 TAPG
D602	32167-406-480	1N4148 TAPG
RD01	32167-406-480	1N4148 TAPG
RD02	32167-406-480	1N4148 TAPG
RD03	32167-406-480	1N4148 TAPG
RD04	32167-406-480	1N4148 TAPG
RD05	32167-406-480	1N4148 TAPG
RD07	32167-406-480	1N4148 TAPG
RD10	32167-406-480	1N4148 TAPG
RD12	32167-406-480	1N4148 TAPG
RD23	32167-406-480	1N4148 TAPG
ED101	32167-406-480	1N4148 TAPG
DN01	32167-406-480	1N4148 TAPG
DN02	32167-406-480	1N4148 TAPG
DN05	32167-406-480	1N4148 TAPG
DN07	32167-406-480	1N4148 TAPG
DN08	32167-406-480	1N4148 TAPG
DS01	32167-406-480	1N4148 TAPG
DN06	32167-406-480	1N4148 TAPG
D202	32167-406-480	1N4148 TAPG
D406	32167-408-060	EQA 02-12B
DN03	32167-408-060	EQA 02-12B
P802	32189-102-030	P2462-J29
P801	32189-609-330	PTH451C02BG360N270
L201	32427-803-130	10μH-K
L501	32427-803-410	8.2μH-M
L404	32427-805-110	1μH-M
L401	32449-712-010	K-10/195μH
L202	32427-805-500	33μH-K
L503	32427-805-500	33μH-K
L506	32427-904-510	200μH-K
L203	32427-904-700	3.9μH-K
L162	32429-014-020	1.3μH-K
L403	32429-039-200	100μH/0.5A
L809	32429-039-200	100μH/0.5A
L811	32429-039-200	100μH/0.5A
L806	32429-039-200	100μH/0.5A
L802	32429-226-080	1μH-K
L807	32429-226-080	1μH-K
L803	32429-226-160	4.7μH-K
L461	32429-805-980	6800μH-K
L801	32429-633-090	39NHX2
X201	32469-011-710	DL 6014434-S.S
X501	32469-105-070	EFD-EN645A 31M
L505	32499-003-010	12μH K-16
T101	32719-044-010	LI 1.37μH ± 12%
T402	32779-110-011	K-10-19
T171	32719-045-010	38.9MHz
T172	32719-045-010	38.9MHz
T444	32859-152-170	FCG-2045BL
L504	32769-111-610	TRF 5424
LN51	32769-111-710	TRF 5423
LN52	32769-111-810	TRF 5423
LN53	32769-111-810	TRF 5423
LN54	32769-111-810	TRF 5423
T401	32849-020-010	50MH, K-16
T801	32899-002-050	P: 160/260 S: 125/12/18V
EJA2	33334-105-040	8MM (RED)
EJA1	33334-105-080	8MM (WHT)
V999A	33359-050-010	B12-262 BASE
SW201	33549-007-010	EVQ-ROB L12/JRS1301
SW801	33529-150-150	70060-200ME
TU001	34519-970-010	ECC-2885LED
Z101	34529-030-060	TSF 1303
Z601	34527-460-003	SFE 5.5HB
Z201	34529-460-010	TPS 5.5MW
Z202	34529-434-010	TPS 6.5MB
Z602	34527-460-005	CDA5.5MC24B
RX01	34539-017-010	HC-18/U, 4.000MHz
X555	34539-040-010	HC-18/U, 4.433619MHz
F801	34709-084-730	FST 250V 3.15A 20MM
RL801	34729-002-010	JC 2A DC 12V
Q101	32119-901-110	MC7812C
IC301	32119-102-300	KA 2131
IC801	32119-401-010	TDA4601
Q801	32149-301-010	2SC3552/WITH, ACC
IC601	32119-201-680	TDA2006

Schematic Location	Supplier Part No.	Description

2. ASSY-PWB CONTROL

***ASSY NO.: 3D33-00303-100**

RP01	31018-277-220	RD 1/4T 22-J
VR101	31202-118-004	VR-BLOCK B250K + 500N
CP01	31607-401-460	CE04W 16V 47M
PA01	32199-101-020	SC-05M
DL101	32309-201-080	ODR-204ALS
PWB	33004-151-951	254 x 36.5 x 1.6T 512Z
SWA01	33529-101-003	JTM-1105B/KPT-1105A
SWA02	33529-101-003	JTM-1105B/KPT-1105A
SWA03	33529-101-003	JTM-1105B/KPT-1105A
SWA04	33529-101-003	JTM-1105B/KPT-1105A
SWA05	33529-101-003	JTM-1105B/KPT-1105A
SWA06	33529-140-710	KHH-MA901 (SKHHAE 0002)
SWA07	33529-140-710	KHH-MA901 (SKHHAE 0002)
SWA09	33529-140-710	KHH-MA901 (SKHHAE 0002)
SWA08	33529-140-710	KHH-MA901 (SKHHAE 0002)

3. ASSY-CRT

V999	32019-255-106	51GGH91X
L406	32439-090-010	DIE-1992GL
L802	32479-029-180	28RT130L 1280
V999M	34099-023-010	JH-8210

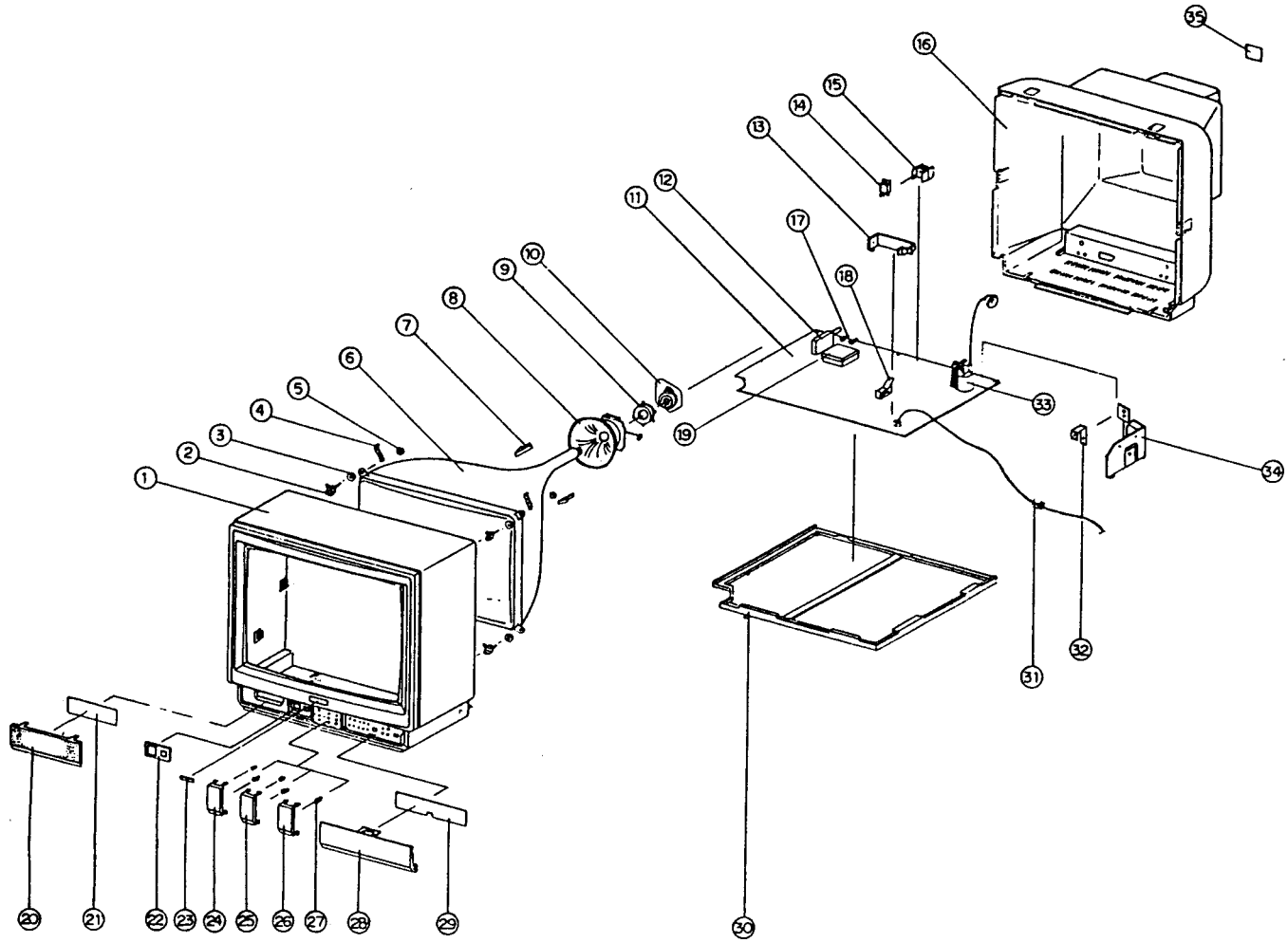
Schematic Location	Supplier Part No.	Description

4. ASSY-TRANSMITTER

(3F14-00007-253 RM07, RM101, 23, M701, NO.)

PW901	33004-430-241	51 x 118 x 1.6T RM101
RT01	31018-277-152	RD 1/4T 1.5K-J
RT02	31018-277-101	RD 1/4T 100-J
RT03	31018-277-103	RD 1/4T 10K-J
CT01	31060-401-440	CE 16V 22μF
CT02	31417-104-400	CK 50V 1000PF-K
CT03	31407-105-660	CC 50V 100PF-J
CT04	31407-105-660	CC 50V 100PF-J
DT01	32167-406-480	1N4148
QT01	32137-301-720	KSC815-Y
XT01	34539-050-010	CSB455EBL
ICT01	32109-201-370	M50560-0019

EXPLODED VIEW



MODEL NO.: CX512ZSE

NO.	CODE NO.	MATERIAL NAME	Q'TY	NO.	CODE NO.	MATERIAL NAME	Q'TY
1	36001-417-010	CABINET-FRONT	1	19	34542-124-510	SHIELD-CASE, TOP	1
2	36614-212-730	BRACKET-CRT	4	20	37713-192-410	GRILLE-WOOFER	1
3	36834-110-110	WASHER-GUM, CRT	4	21	36844-113-250	CUSHION-FELT	1
4	36633-101-610	CLAMPER-WIRE	2	22	37654-122-520	WINDOW-FS	1
5	37208-115-001	NUT-HEX	4	23	37714-313-410	INLAY-BRAND	1
6	32019-255-106	CRT-COLOR	1	24	37624-131-360	KNOB-VR (VOLUME)	1
7	36814-101-911	SPACER-DY	3	25	37624-131-350	KNOB-VR (C/P)	1
8	32439-090-010	DEFL-YOKE	1	26	37624-131-340	KNOB-VR (POWER)	1
9	34099-023-010	MAGNET-CONVERGENCE	1	27	36674-135-310	SPRING-COIL	6
10	33529-050-010	CRT-SOCKET	1	28	37743-107-610	DOOR-VR, BOX	1
11	33004-153-840	PWB-MAIN (S.N.A)	1	29	37712-106-920	INLAY-VR, CONTROL	1
12	34519-970-010	TUNER	1	30	36021-103-310	HOLDER-CHASSIS	1
13	*3H83-00030-000	HEAT-SINK, POWER	1	31	36603-111-310	HOLDER-CORD	1
14	32119-201-680	IC TDA2006 (IC601)	1	32	36614-224-110	BRKT-FBT	1
15	*3H84-00020-001	ASSY-HEAT-SINK, TR	1	33	32859-152-170	TRANS-FLYBACK	1
16	36001-418-010	CABINET-BACK	1	34	*3H80-00120-001	HEAT-SINK, 54	1
17	33334-105-040	JACK-PIN RED	1	35	38113-115-200	LABEL-RATING	1
18	*3H82-00010-000	HEATSINK-VERT	1				

CHASSIS NAME : P-54S
CODE NO. : 38104-182-790

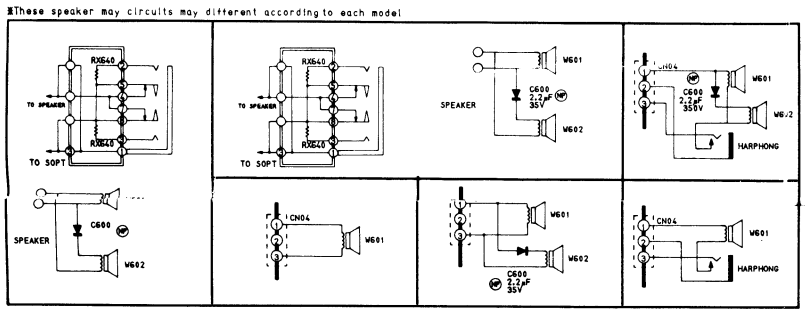
OBSERVATION OF VOLTAGES AND WAVEFORMS

1. Voltages read with "VTVM" from point shown to chassis ground. line voltage 220volts color bar signal.
2. Voltages reading may vary ±20%.
3. The schematic shown is representative only.
4. All waveforms are taken using a wide band oscilloscope and a low capacity probe.
5. Check FINE TUNING, AGC, BRIGHTNESS, CONTRAST, and COLOR controls for best picture.
6. Waveforms are taken using a standard color bar signal.

EXPRESSION
1. Resistance is shown in
2. Unless otherwise noted expressed in ohm, the
3. Unless otherwise noted and the value less th

NOTE
The circuits subject to c

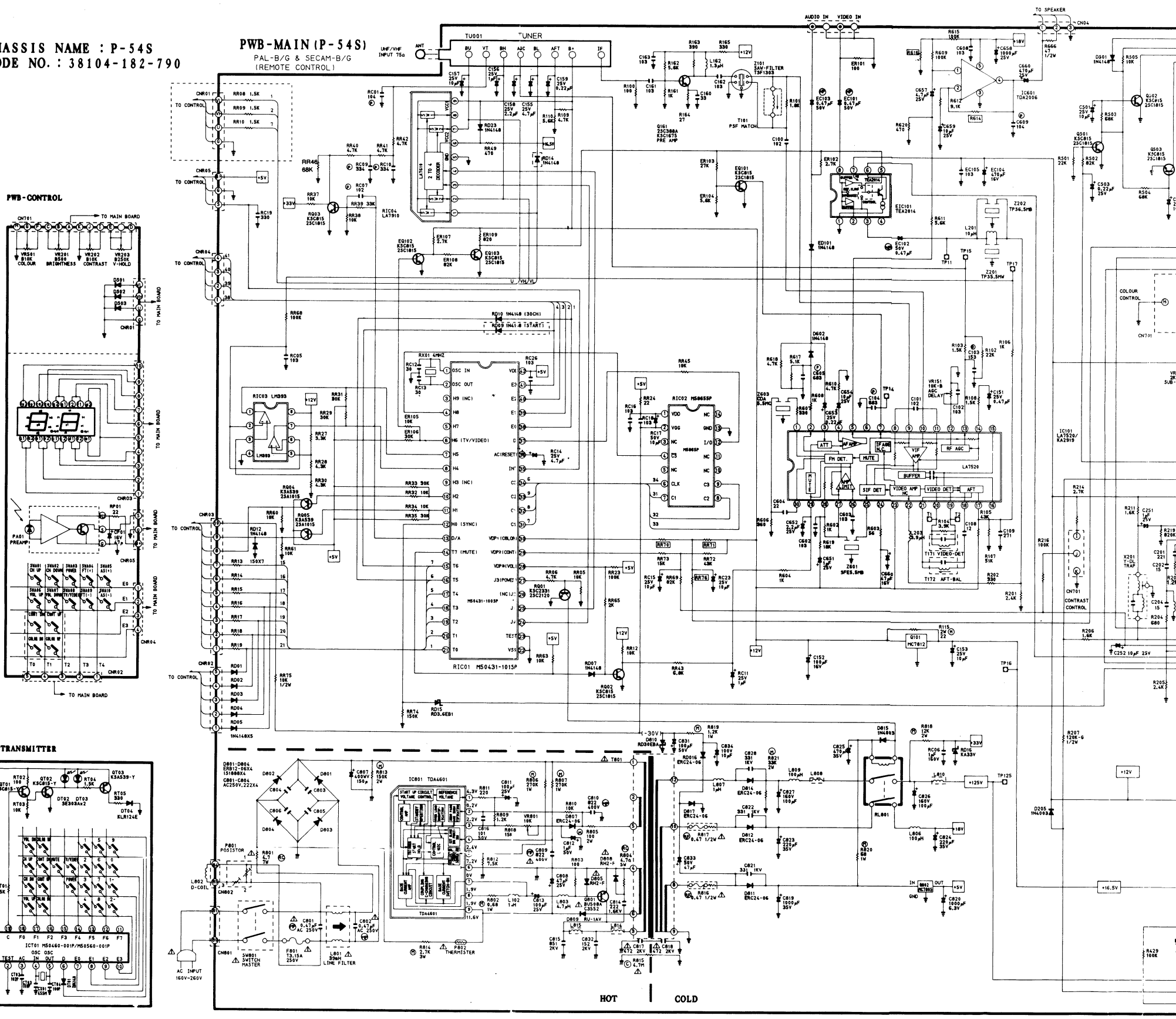
※These speaker may circuits may different according to each model



TP-11	PIN ⑤ OF IC501	PIN ⑯ OF IC501	PIN ⑰ OF IC501	TP-51	PIN ① OF MCTQ1	PIN ㉘ OF IC501	PIN ㉜ OF IC501
2.7V p-p (H)	220mV P-P(H)	500mV P-P(H)	420mV P-P(H)	3.5V p-p (H)	120V p-p (H)	5.8V p-p (H)	2.8V p-p (H)
PIN ③ OF IC501	PIN ⑧ OF IC501	PIN ⑮ OF IC501	PIN ⑲ OF IC501	PIN ⑦ OF MCT01	PIN ③ OF MCT01	PIN ㉙ OF IC501	PIN ㉜ OF IC50
860mV P-P(H)	1.6V P-P(H)	310mV p-p (H)	420mV P-P(H)	120v p-p (H)	120V p-p (H)	9.5V p-p (H)	2.4V p-p (H)

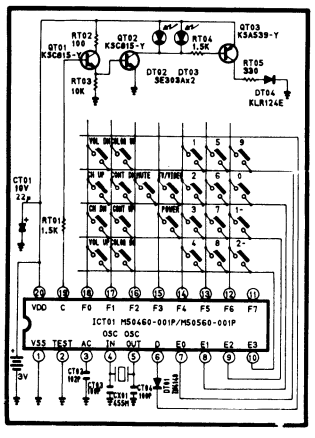
PWB-MAIN (P-54S)

PAL-B/G & SECAM-B/G
(REMOTE CONTROL)



PWB-CONTROL

PWB-TRANSMITTER



OBSERVATION OF VOLTAGES AND WAVEFORMS

1. Voltages read with "VTVM" from point shown to chassis ground.
   line voltage 220volts color bar signal.
2. Voltages reading may vary ±20%.
3. The schematic shown is representative only.
4. All waveforms are taken using a wide band oscilloscope and a low capacity probe.
5. Check FINE TUNING, AGC, BRIGHTNESS, CONTRAST, and COLOR controls for best picture.
6. Waveforms are taken using a standard color bar signal.

EXPRESSION

1. Resistance is shown in ohm. K = 1,000 M = 1,000,000.
2. Unless otherwise noted in schematic all capacitor values less than 1 are expressed in mfd, the values more than 1 in pF.
3. Unless otherwise noted in schematic, all inductor values are expressed in uH. and the value less than 1 in mH.

NOTE

The circuits subject to change without notice to improve the picture quality.

OF IC501	PIN 16 OF IC501	PIN 17 OF IC501	TP-51	PIN 1 OF MCTQ1	PIN 58 OF IC501	PIN 34 OF IC501	PIN 42 OF L406
-P(H)	500mV P-P(H)	420mV P-P(H)	3.5V p-p (H)	120V p-p (H)	5.8V p-p (H)	2.8V p-p (H)	55v p-p (H)
OF IC501	PIN 15 OF IC501	PIN 13 OF IC501	PIN 2 OF MCT01	PIN 3 OF MCT01	PIN 59 OF IC501	PIN 32 OF IC501	PIN 27 OF IC501
(H)	310mV p-p (H)	420mV P-P(H)	120v p-p (H)	120V p-p (H)	9.5V p-p (H)	2.4V p-p (H)	2.6V p-p (H)

CAPACITOR	
TYPE	MARK
Ceramic	No Mark
Polyester	P
Tantalium	T
Metal Polyestor	MP
Polypropylene	P.P
Polyester Polypro	DSR
Chemical Electrolytic	+
Chemical Non-Polar	

RESISTOR	
TYPE	MARK
Carbon Composition	C
Oxide Metal Film	M
Metal Film	RM
Cement	R-C
Variable Resistor	
Positive Resistor	

COLOUR CONTROL

SYSTEM / LOC	MANUAL VR	MANUAL UP/DN
RR70	1.8K	51K
RR71	150K	OPEN
RR76	220K	56K
RN08	10K	560K

REPLACEMENT TABLE

LOC. \ INCH	14", 16"		18" 20"	
R315	(M) 270, 1W		(M) 330 1W	
R614	82K		100K	
R616	36K		62K	
C413	271 2KV		681 2KV	
C414	(P.P) 0.47 400V (P.P) ※ 0.56 400V		(P.P) 0.43 400V	
L401	157μH		195μH	
T402	K-20-14		K-10-19	
Q404	2SD1650		2SD1651	
	2SD1554		2SD1555	
L406	DIE-1492HL/B18380		DIE-1992GL	
	DIE-1692HL		B1810	
T444	FCG 1445EL		FCG 2045BL	
V999	CRT	R208	CRT	R208
	370B22/BA37-573X	(M) 1/2W 127K-F	5106B22/510UXB22	(M) 1/2W 110K-F
	3720B22	(M) 1/2W 110K-F	51GGH91X/5120B22	(M) 1/2W 91K-F
	4201B22	(M) 1/2W 127K-F		
	420GN91X	(M) 1/2W 110K-F		

PWB - CRT

COLD

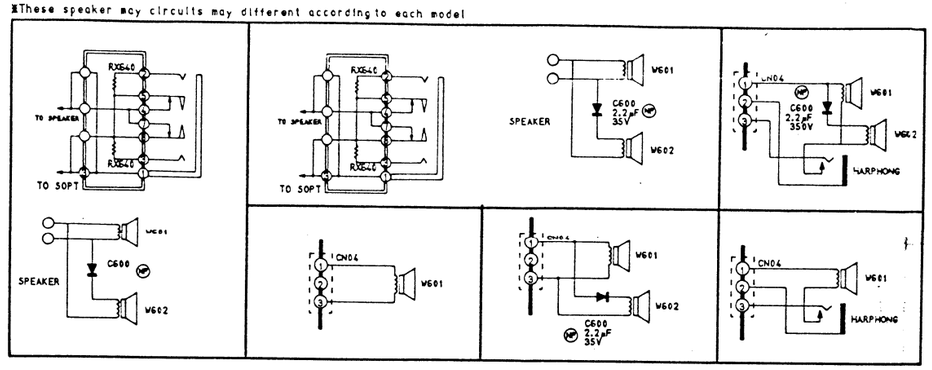
CHASSIS NAME : P-54S
CODE NO. : 38104-182-790

PWB-MAIN (P-54S)

PAL-B/G & SECAM-B/G
(REMOTE CONTROL)

PWB-CONTROL

※These speaker may circuits may different according to each model



OBSERVATION OF VOLTAGES AND WAVEFORMS

1. Voltages read with "VTVM" from point shown to chassis ground, the voltage 220volts color bar signal.
2. Voltage reading may vary ±20%.
3. The schematic shown is representative only.
4. All waveforms are taken using a wide band oscilloscope and a low capacity probe.
5. Check FINE TUNING, AGC, BRIGHTNESS, CONTRAST, and COLOR controls for best picture.
6. Waveforms are taken using a standard color bar signal.

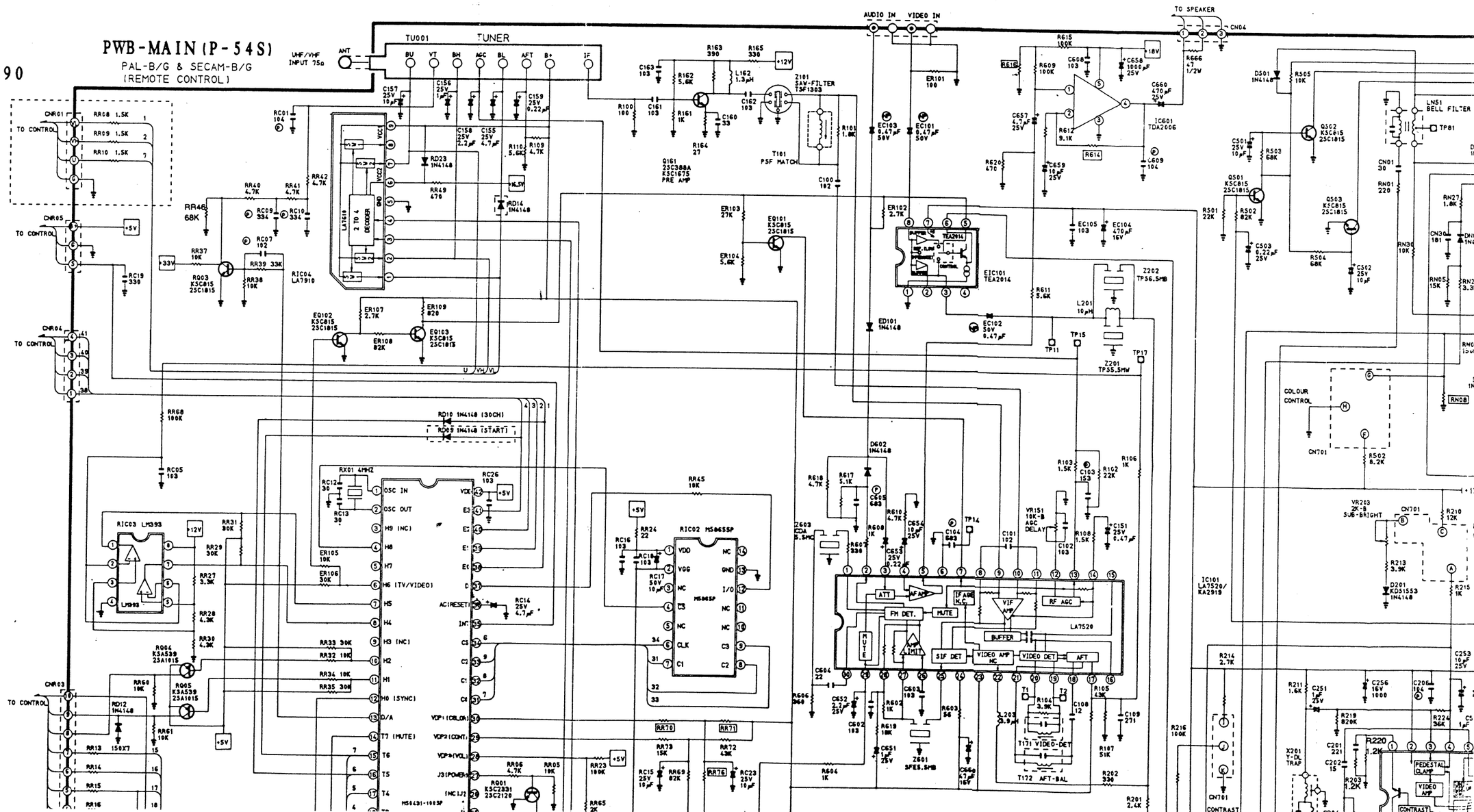
EXPRESSION

1. Resistance is shown in ohm. K = 1,000 Ω = 1,000,000
2. Unless otherwise noted in schematic all capacitor expressed in μfd, the values more than 1 in pF.
3. Unless otherwise noted in schematic, all inductor and the values less than 1 in mH.

NOTE

The circuits subject to change without notice to impr

TP-11	PIN ⑤ OF IC501	PIN ⑩ OF IC501	PIN ⑰ OF IC501	TP-51	PIN ① OF MCT01	PIN ㉘ OF IC501	PIN ㉜ OF IC501	PIN ㉞ OF L4
2.7V p-p (H)	220mV P-P(H)	500mV P-P(H)	420mV P-P(H)	3.5V p-p (H)	120V p-p (H)	5.8V p-p (H)	2.8V p-p (H)	55v p-p (H)
PIN ③ OF IC501	PIN ⑧ OF IC501	PIN ⑮ OF IC501	PIN ⑲ OF IC501	PIN ② OF MCT01	PIN ③ OF MCT01	PIN ㉙ OF IC501	PIN ㉝ OF IC501	PIN㉗ OF IC50
860mV P-P(H)	1.6V P-P(H)	310mV p-p (H)	420mV P-P(H)	120v p-p (H)	120V p-p (H)	9.5V p-p (H)	2.4V p-p (H)	2.6V p-p (H)



OBSERVITION OF VOLTAGES AND WAVEFORMS

1. Voltage read with "VTVM" from point shown to chassis ground.
   line voltage 220volts color bar signal.
2. Volt age reading may vary ±20%.
3. The schematic shown is representative only.
4. All waveforms are taken using a wide band oscilloscope and a low capacity probe.
5. Check FINE TUNING, AGC, BRIGHTNESS, CONTRAST, and COLOR controls for best picture.
6. Wav eforms are taken using a standard color bar signal.

EXPRESSION

1. Resistance is shown in ohm. K = 1,000 M = 1,000,000
2. Unless otherwise noted in schematic all capacitor values less than 1 are expressed in mfd, the values more than 1 in pF.
3. Unless otherwise noted in schematic, all inductor values are expressed in uH, and the values less than 1 in mH.

NOTE

The circuits subject to change without notice to improve the picture quality.

⑦ OF IC501	TP-51	PIN ① OF MCTQ1	PIN ⑱ OF IC501	PIN ㉜ OF IC501	PIN V3 OF L406
20mV P-P(H)	3.5V p-p (H)	120V p-p (H)	5.8V p-p (H)	2.8V p-p (H)	55v p-p (H)
PIN ⑬ OF IC501	PIN ② OF MCT01	PIN ③ OF MCT01	PIN ㊴ OF IC501	PIN ㉜ OF IC501	PIN ㉗ OF IC501
20mV P-P(H)	120v p-p (H)	120V p-p (H)	9.5V p-p (H)	2.4V p-p (H)	2.6V p-p (H)

CAPACITOR	
TYPE	MARK
Ceramic	No Mark
Polyester	P
Tantalium	T
Metal Polyestor	MP
Polypropylene	P.P
Polyester Polypro	DSR
Chemical Electrolytic	
Chemical Non-Polar	

RESISTOR	
TYPE	MARK
Carbon Composition	C
Oxide Metal Film	M
Metal Film	RM
Cement	R-C
Variable Resistor	
Positive Resistor	

COLOUR CONTROL

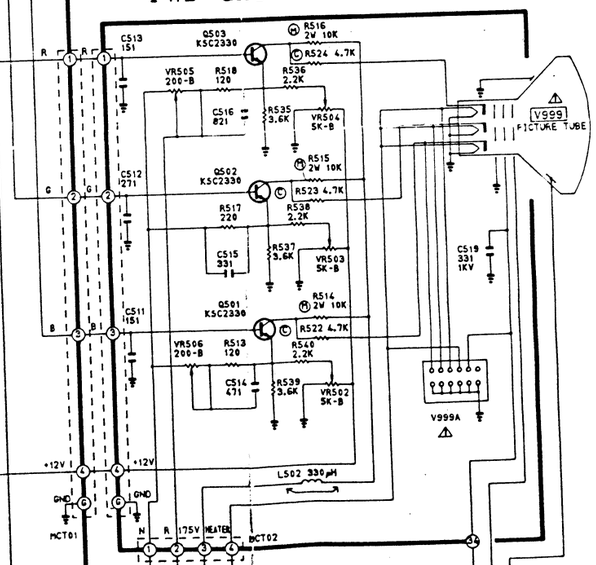
LOC \ SYSTEM	MANUAL VR	MANUAL UP/DN
RR70	1.6K	51K
RR71	180K	OPEN
RR76	220K	56K
RN08	10K	560K

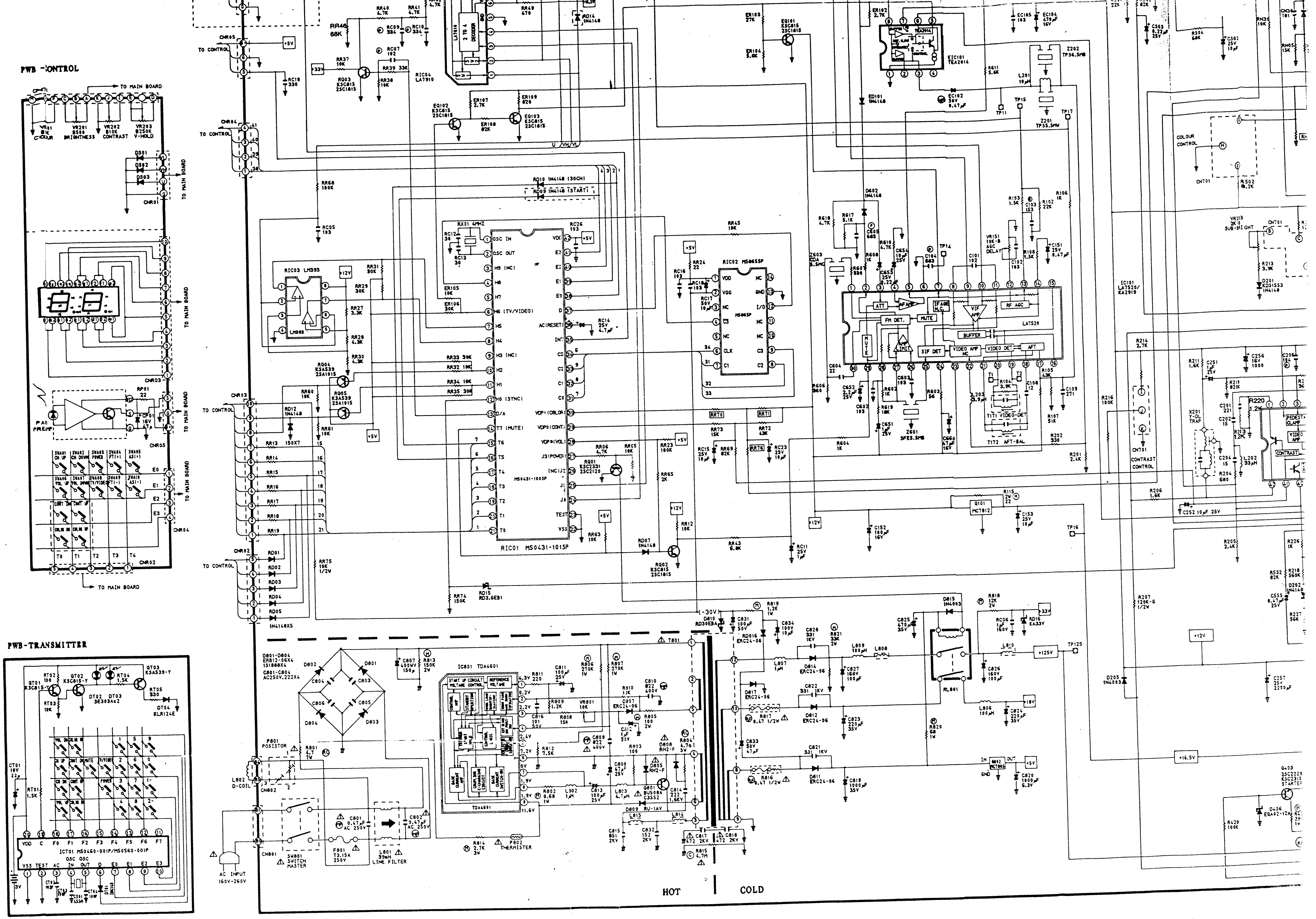
REPLACEMENT TABLE

LOC. \ INCH	14", 16"	18" 20"
R315	(M) 270. 1W	(M) 330 1W
R614	82K	100K
R616	36K	62K
C413	271 2KV	681 2KV
C414	(P.P) 0.47 400V	(P.P) 0.43 400V
	(P.P) ※ 0.56 400V	
L401	157μH	195μH
T402	K-20-14	K-10-19
Q404	2SD1650	2SD1651
	2SD1554	2SD1555
L406	DIE-1492HL/※18380	DIE-1992GL
	DIE-1692HL	※1810
T444	FCG 1445EL	FCG 2045BL

	CRT	R208	CRT	R208
V999	3701B22/※A37-573X	(M) 1/2W 127K-F	5106B22/510UXB22	(M) 1/2W 110K-F
	3720B22	(M) 1/2W 110K-F	51GGH91X/5120B22	(M) 1/2W 91K-F
	4201B22	(M) 1/2W 127K-F		
	42GGN91X	(M) 1/2W 110K-F		

PWB - CRT




PWB-CONTROL
TO MAIN BOARD
VR201 B500 BRIGHTNESS
VR202 B10K CONTRAST
VR203 B250K V-HOLD
DS01
DS02
DS03
CNR01
CNR03
CNR05
CNR04
CNR02
RP01 22
CP01 16V 47μ
PAll PREAMP
SWA01 CH UP
SWA02 CH DOWN
SWA03 POWER
SWA04 FT(+)
SWA05 AS(+)
SWA06 VOL UP
SWA07 VOL DOWN
SWA08 TV/VIDEO
SWA09 FT(-)
SWA10 AS(-)
E0
E1
E2
E3
T0
T1
T2
T3
T4
PWB-TRANSMITTER
QT01 KSC815-Y
RT02 100
QT02 KSC815-Y
RT04 1.5K
QT03 KSA539-Y
RT03 10K
DT02 DT03 SE303Ax2
RT05 330
DT04 KLR124E
CT01 10V 22μ
RT01 1.5K
ICT01 MS0460-001P/MS0560-001P
VDD C F0 F1 F2 F3 F4 F5 F6 F7
VSS TEST AC OSC IN OSC OUT D E0 E1 E2 E3
3V
TO CONTROL
RC19 330
RR46 68K
RR37 10K
RQ03 KSC815 2SC1815
RR39 33K
RR38 10K
RC07 102
RC09 334
RC10 334
RR40 4.7K
RR41 4.7K
RIC04 LA7910
2 TO 4 DECODER
RR49 470
RD14 1N4148
ER107 2.7K
ER109 820
EQ102 KSC815 2SC1815
EQ103 KSC815 2SC1815
ER108 82K
U VH VL
RR68 100K
RC05 103
RD10 1N4148 (30CH)
RD09 1N4148 (START)
RIC03 LM393
RR31 30K
RR29 30K
RR27 3.3K
RR28 4.3K
RR30 4.3K
RQ04 KSA539 2SA1015
RQ05 KSA539 2SA1015
RR60 10K
RR61 10K
RD12 1N4148
150X7
RR13
RR14
RR15
RR16
RR17
RR18
RR19
RD01
RD02
RD03
RD04
RD05
1N4148X5
RR75 10K 1/2W
RX01 4MHZ
RC12 30
RC13 30
OSC IN
OSC OUT
H9 (NC)
H8
H7
H6 (TV/VIDEO)
H5
H4
H3 (NC)
H2
H1
H0 (SYNC)
D/A
T7 (MUTE)
T6
T5
T4
T3
T2
T1
T0
VDD
AC(RESET)
INT
VDP1(COLOR)
VDP2(CONT)
VDP3(VOL)
J3(POWER)
(NC)J2
TEST
VSS
MS0431-100SP
RIC01 MS0431-101SP
ER105 10K
ER106 30K
RR33 30K
RR32 10K
RR34 10K
RR35 30K
RC26 103
RC14 25V 4.7μF
RR06 4.7K
RR05 10K
RQ01 KSC2331 2SC2120
RR23 100K
RR65 2K
RR63 10K
RR12 10K
RD07 1N4148
RQ02 KSC815 2SC1815
RR43 6.8K
RD15 RD3.6EB1
RR74 150K
RR45 10K
RR24 22
RC16 103
RC18 103
RC17 50V 10μF
RIC02 MS6465SP
RR70
RR71
RR73 15K
RR72 43K
RC15 25V 10μF
RR69 82K
RR76
RC23 25V 10μF
RC11 25V 1μF
ER103 27K
ER104 5.6K
EQ101 KSC815 2SC1815
ER102 2.7K
EIC101 TEA2014
ED101 1N4148
EC102 50V 0.47μF
EC105 103
EC104 470μF 16V
R611 5.6K
L201 10μH
Z202 TP56.5MB
Z201 TP55.5MW
TP11
TP15
TP17
TP14
D602 1N4148
R618 4.7K
R617 5.1K
C605 683
R610 4.7K
C654 10μF 25V
C653 25V 0.22μF
R608 1K
R607 330
Z603 CDA 5.5MC
C104 683
C101 102
VR151 10K-B AGC DELAY
C102 103
R103 1.5K
C103 153
R102 22K
R108 1.5K
R106 1K
C151 25V 0.47μF
ATT
AF AMP
IF AGC N.C.
VIF AMP
RF AGC
FM DET.
MUTE
BUFFER
AMP LIMIT
SIF DET
VIDEO AMP NC
VIDEO DET
AFT
LA7520
IC101 LA7520/KA2919
C604 22
C652 2.2μF 25V
C602 103
R602 1K
R619 10K
C651 1μF 25V
C603 103
Z601 SFE5.5MB
R603 56
C660 47μF 16V
L203 3.9μH
R104 3.9K
T1
T2
C108 12
T171 VIDEO-DET
T172 AFT-BAL
R105 43K
R107 51K
C109 271
R604 1K
R202 330
R201 2.4K
Q101 MC7812
R115 2W 22
C153 25V 10μF
C152 100μF 16V
TP16
+5V
+12V
+33V
COLOUR CONTROL
CN701
R502 8.2K
R504 68K
C503 0.22μF 25V
C502 25V 10μF
VR203 2K-B SUB-BRIGHT
R213 3.9K
D201 KDS1553 1N4148
R214 2.7K
R216 100K
CONTRAST CONTROL
R211 1.6K
C251 1μF 25V
C256 16V 1000
R219 820K
C201 221
C202 15
X201 Y-DL TRAP
R220 1.2K
R203 1.2K
C204 15
L202 33μH
R204 680
PEDESTAL CLAMP
VIDEO AMP
CONTRAST
R206 1.6K
C252 10μF 25V
R205 2.4K
R226 1K
R532 82K
R218 560K
D202 1N4148
C555 0.47μF 25V
R227 56K
R207 120K-G 1/2W
D205 1N4003
C257 25V 2200μF
+16.5V
Q403 2SC2229 KSC2310 STARTER
D406 EQA02-12A
R429 100K
-30V
D810 RD30EBA
C831 100μF 50V
R819 1.2K 1W
C834 100V 10μF
RD016 ERC24-06
T801
D801-D804 ERB12-06X4 1S1888X4
C801-C804 AC250V,222X4
D802
D801
C804
C803
C806
C805
D804
D803
C807 400WV 150μ
R813 150K 2W
IC801 TDA4601
START UP CIRCUIT VOLTAGE CONTROL
REFERENCE VOLTAGE
TDA4601
4.3V
0.2V
2.2V
2.4V
7.2V
0V
1.9V
11.6V
R811 220
C811 100μF 25V
R806 270K 1W
R807 270K 1W
R810 1.1K
C810 822 400V
R809 1.2K
VR801 10K
D807 ERC24-06
R805 100 2W
C816 101 50V
R808 15K
C812 1μF 50V
C809 822 400V
R812 7.5K
R803 100
D808 RH2-F
R804 4.7Ω 5W
C808 47μF 25V
D805 RH2-F
Q801 BUS08A C3552
R802 0.68 1W
L302 1μH
C813 100μF 25V
L803 4.7μH
C814 222 1.6KV
D809 RU-1AV
L815
L814
C815 851 2KV
C832 152 2KV
C817 472 2KV
C818 472 2KV
R815 4.7M
P801 POSISTOR
R801 4.7 7W
L802 D-COIL
CN802
CN801
SW801 SWITCH MASTER
C801 0.47μF AC 250V
F801 T3.15A 250V
L801 39mH LINE FILTER
C802 0.47μF AC 250V
R814 2.7K 3W
P802 THERMISTER
AC INPUT 160V-260V
C828 331 1KV
R821 33K 2W
L809 100μH
L808
L807 1μH
D814 ERC24-06
C827 160V 100μF
D817 ERC24-06
C822 331 1KV
D812 ERC24-06
R817 0.47 1/2W
C823 220μF 35V
C833 50V 47μF
C821 331 1KV
D811 ERC24-06
R816 0.47 1/2W
C819 1000μF 35V
C825 470μF 35V
D815 1N4003
R818 12K 2W
RC06 1μF 160V
RD16 KA33V
L810
+125V
TP125
C826 160V 100μF
RL801
L806 100μH
C824 220μF 35V
18V
R820 68 1W
IN OUT GND
Q802 MC7805
C820 1000μF 6.3V
HOT
COLD

V999	3760822/EA37-573A	1/2W	127K-F	110K-F
	3720822	1/2W	110K-F	51GGN91X/5120822
	4201822	1/2W	127K-F	91K-F
	42GGN91X	1/2W	110K-F	

PWB-CRT

HOT | COLD